

# STRATEGIC SAFETY ALTERNATIVES FOR ALCAN KITIMAT WORKS

by

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## **ABSTRACT**

This project is a strategic analysis of the safety strategy at Alcan Kitimat Works Smelter (KWS) in Kitimat, BC. The objective of this project is to develop a list of strategic alternatives and recommendations for improving safety culture and safety performance at KWS.

Superior safety performance has been recognized by the industry as a competitive advantage. Positive safety results impact operating costs and improve gross margins by reducing costs directly related to injuries such as WCB premiums and fines. Asset turnover increases by eliminating production downtime and equipment damage resulting. Both improvements will increase return on equity and maximize value to shareholders.

Nearly half of KWS's lost time accidents are related to lack of awareness and unrecognized risk. The current safety culture includes a high risk tolerance; a mindset that needs to change. Recommendations are made to facilitate this cultural change along with other identified cultural and safety performance issues.

## **DEDICATION**

To my husband and son for supporting me throughout this program, especially during the writing of this paper, and to my mother and mother-in-law for their willingness to sacrifice their weekends to baby-sit. I couldn't have done it without you. I love all of you.

## **ACKNOWLEDGEMENTS**

I wish to express my thanks to Dr. Michael Parent for his encouragement and guidance during this project, and also Dr. Mark Selman for his input and advice in the final stages.

I would like to thank my employer, Alcan Inc., for providing this incredible learning opportunity over the last four years. In addition I would like to thank Nick Tremblay for being my Alcan sponsor and assisting me collecting the information I required to complete this project.

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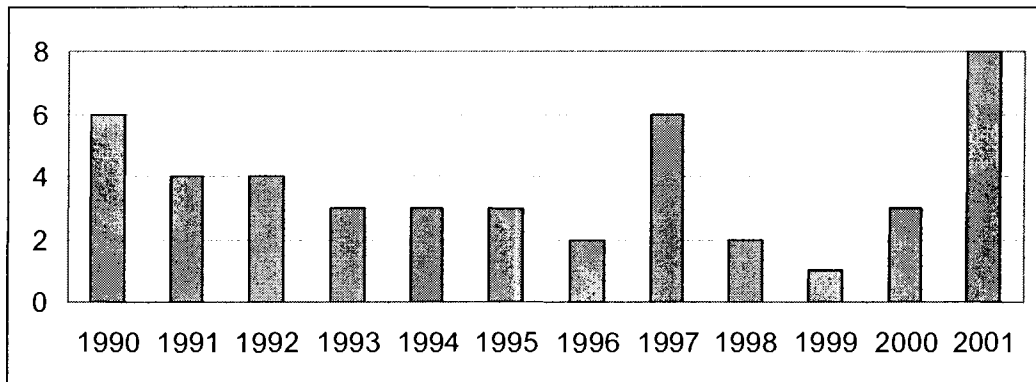
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# 1 DESCRIPTION OF THE ORGANIZATION

Alcan Inc. is a publicly held international, multicultural, value driven company. Alcan Inc.'s operation is divided into four business groups who are vertically integrated: Bauxite and Alumina, Primary Metal, Engineered Products, and Packaging. The focus of this paper is the Primary Metal Division of Alcan, which consists of twenty-two smelters operating in fourteen different countries, with the focal point being the Kitimat Works Smelter, (KWS) located in Kitimat, B.C. Canada.

Since the end of 2001, safety has come to the forefront of the organization and has become a major strategic objective. 2001 was a difficult year with Alcan Inc. experiencing eight fatalities worldwide. This was the worst results in over ten years. Refer to Figure 1.1.1 Lost time accidents and recordable injuries also spiked upward in 2001 after a four year decline.

**Figure 1.1: Fatal Accidents Within Alcan 1990 - 2001**



Source: Data from "Employee Health & Safety: A Call to Action." Alcan Presentation, March 2002. Chart made by author. All charts in this report are made by the author unless otherwise stated.

This project will analyze the current safety results and safety culture at KWS. Present safety issues are discussed as KWS is compared with other Alcan Smelters and the Aluminium Industry. Safety results for KWS are currently poor despite large amounts of effort and money invested into improving results. In the March 2005 issue of the Ingot, Plant Manager Paul Henning stated. “We currently have the dubious distinction of being the leader in Alcan Primary Metal Group when it comes to most recordable and most lost time accidents in a three-month period.”<sup>i</sup>

The objective of this project is to generate strategic alternatives for the safety organization in KWS to improve the safety culture and safety performance.

## **1.1 History of Alcan Kitimat Works**

In the late 1940’s the premier of British Columbia invited Alcan to come to British Columbia and build what would become known as Alcan Kitimat Works Smelter and Kemano. The project involved constructing the Kenny Dam, blasting a 16-kilometer tunnel through the mountains to carry water to a powerhouse built inside Mt. DuBose. A power transmission line was strung over some of the most rugged terrain in the province to carry power to an aluminum smelter built at Kitimat. A deep-water port was developed at the head of the Douglas Channel, and the communities of Kitimat and Kemano were created.<sup>ii</sup>

The project was an unprecedented engineering feat, unparalleled in Canadian history.. The massive Alcan Project in northwest British Columbia was completed in just five years – dam, tunnel, powerhouse, Kemano, transmission line, smelter, and Kitimat. In the post-war industrial boom worldwide, the Project was the largest

construction job for the time with thousands participating in its feverish work pace. Records were set, innovation was at every turn, and the result was the largest smelter in the world and the premier community to go with it.

In 1954 the first ingot was poured in Kitimat. The plant officially opened August 3, 1954 with His Royal Highness Prince Philip, Duke of Edinburgh, tapping the first ingot.

## **1.2 Current State of Alcan Kitimat Works**

Currently, 2005, Alcan Inc. has approximately 70,000 employees in 55 countries and regions around the globe. The Primary Metal group has 20,000 employees with 1639 of them working at KWS. The KWS Kemano power house is operating at 100% capacity, or 896MW of power, and the smelter is at 89% capacity or 242,000 tonnes of metal annually.

KWS prides itself on its ability to provide customers with high quality product, alloyed to the most exact standards. Customer service and support are seen as critical elements of the business. KWS works hard to compete on product and service differentiation. Operating efficiencies and cost reductions are a very important part of KWS's day to day operations as having a cost advantage is critical in this predominately commoditized market. Due to the age and technology in the plant every advantage possible is required to keep KWS sustainable into the future.

### **1.2.1 Alcan Kitimat Works Governing Objective**

All of Alcan Inc, including KWS, has the same governing objective. "Maximizing Value- A Sustainable Business Proposition".

This governing objective is made up of two parts, which are viewed as complementary: Maximizing Value and Corporate Sustainability. The belief is that a healthy, profitable enterprise has a much greater capacity to improve its sustainability than a struggling or poorly performing company. CEO Travis Engan describes the objective this way, “Having Maximizing Value as a governing objective provides us with the practical framework by which we can increase shareholder value and ensure Alcan's sustainability for the future”.<sup>iii</sup> At Alcan, common values of integrity, accountability, trust, transparency, and teamwork that guide us in our dealings with customers, suppliers, and other stakeholders.”<sup>iv</sup>

### **1.2.2 Alcan Kitimat Works Product Mix**

KWS produces molten aluminum, hot metal, at its smelter and then transfers the hot metal to its casthouse to make three general cold metal products.

**Sheet ingot:** Sheet ingot is KWS's main product. Aluminum is cast into huge slabs and then cut to length on a large band saw. Sheet is alloyed to the customer's specifications and is considered a value-added product. This is the most profitable product for KWS. Its end uses include can manufacturing, aluminum building panels, lithographic plates, foil and other rolled products.

**Extrusion ingot:** This ingot, commonly referred to as billet, is alloyed to customer specifications. Its end uses are products extruded through a die, such as door and window sash, structural members, store front curtain wall and truck panels.

**Trilok ingot:** The trilok ingot, or remelt ingot, is the true commodity product, an unalloyed, pure aluminum ingot. Production of the trilok ingot is held to a minimal level, due to its low profitability. Trilok is remelted by the customer.

Safety results can be impacted by product mix. There is increased risk of injury when trilok is produced because the process requires more manual labour. The trilok ingots are stacked

together manually before being strapped together. This requires employees to be bending over and lifting, not surprisingly the most typical injury related to trilok production is a back injury. The production of sheet and extrusion carry equally rated safety risks due to similar automated processes, with the highest risk being burns due to handling the hot metal.

### **1.2.3 Alcan Kitimat Works Markets**

The primary metal market is comprised of competitors producing four main products, sheet ingot, extrusion ingot, remelt ingot and wire. KWS competes in the first three markets. The products end up in four general markets, consumer goods, transportation such as the automotive industry, building and construction, and other industrial applications.

The market has seen growth of three to four percent per year over the last few years and the same average growth rate is forecasted for the long-term. Capacity within the market has been increasing at a near identical pace and this has resulted in slightly more supply than demand and slowly rising world inventories. At the beginning of 2004 world inventories began to drop as the world demand growth rate saw an increase, mainly from China, and this has resulted in price increases. At the beginning of 2002 the average three month London Metal Exchange (LME) was just under \$1400 US per tonne; by the end of 2004 the price had risen to over \$1800 US per tonne.

Prices will drop if supply increases, and 8.5% of the worldwide aluminum capacity is currently idle. However; this idle capacity would be costly to restart, and tight margins mean additional capacity will only occur in areas where there are abundant inexpensive energy resources.

### **1.2.4 Alcan Kitimat Works Customers**

Due to the location of KWS, the customer base is global. KWS services customer in North America by rail, and Asia by boat, China, Japan and Korea. These customers use KWS's

metal to produce value-added end user products. Building and construction (18%), transportation (30%), consumer durables (6%), machinery & equipment (8%), electrical (9%), cans (12%). Other packaging (6%), other (12%)<sup>v</sup>

For KWS having customers who are in growth industries is vital and a critical part of KWS remaining sustainable into the future. Examples of KWS customers include FEC Inc. who purchase sheet ingot for the product of construction tools and equipment. FEC introduced the first electric nutrunner to the North American market & continues to lead the industry in electric fastening technology. Another customer is SAPA, who purchase billet. Sapa one of the world's leading producers of extruded aluminum profiles. Both of these customers compete in markets which are experiencing growth. The aluminum profiles market saw an 11% increase in demand from 2003 to 2004 in North America, and 5% in Europe.<sup>vi</sup>

### **1.2.5 Alcan Kitimat Works Suppliers**

Due to the highly vertically integrated nature of Alcan Inc. KWS is provided with the majority of its raw materials and supplies internally. This is typical of the industry as processes are tailored to handle a particular raw material. A sudden change in alumina or calcined coke, in a sodberg operation can result in months of poor operational efficiencies as the process has to be adjusted to handle the new raw material. The direct result is decreased production and increased energy consumption on a per tonne basis.

In a market where cost is the biggest competitive advantage having a consistent supply for raw materials is also a competitive advantage due to the impact on costs. Safety results in a sodberg environment can also be affected by changes in raw materials as unstable pots require more manual attention and adjustments, killing anode effects or dealing with carbon outs, putting operators at risk.



KWS does work to support the surround communities and is an important part of the local economy. In 2002 KWS spend \$43.5 million in Kitimat alone and a total of \$90.7 million from businesses in BC purchasing other supplies and materials.

### **1.2.6 Alcan Kitimat Works Strategic Issues**

The strategic focus at KWS revolves around Alcan Inc.'s three strategic components:<sup>vii</sup>

**FINANCIAL FOCUS** – Value-Based Management is the basis for all strategic investment decisions and value generating initiatives. Cost control and reduction is critical as KWS strives to be competitive in the global market place with an aging smelter. However, it has been made very clear that these cost reduction can not come at the expense of health, safety, or the environment.

KWS does have a competitive cost advantage in power costs by owing its own powerhouse. As world energy prices increase this cost advantage will become ever increasingly important.

**ENVIRONMENT, HEALTH AND SAFETY FOCUS** – The EHS First policy introduces common standards, procedures and the required mindset for achieving excellence in Alcan's performance in environment, health and safety for the benefit of employees and for the communities in which Alcan Inc. operates. *EHS FIRST* represents an ironclad commitment from each Alcan employee and from all levels of the organization to improve through increased awareness, knowledge sharing, and by applying best practices. EHS First was initiated in 2002 as a result of the 2001 safety performance.

**CORPORATE SUSTAINABILITY** – The Continuous Improvement Program is aimed at maximizing opportunities by improving Alcan's competitiveness and efficiency. The Continuous Improvement program combines two complementary approaches – Lean Manufacturing and Six Sigma – to provide a full range of tools for the business to choose the most appropriate improvement techniques for each situation.

In terms of Competitive Strategy KWS strives to differentiate itself from other primary metal producers. This strategy is backed up by the decision to produce as little trilok ingot as

possible, and not enter the true pure aluminum commodity market, where cost is the key competitive advantage.

KWS produces a variety of alloyed billet and sheet, catering to a niche market. Technical assistance is provided to customers along with product. Customers can receive advice on their own internal process problems and KWS will work with the customer to determine the exact alloy mix required for the application.

## 2 EXTERNAL ANALYSIS

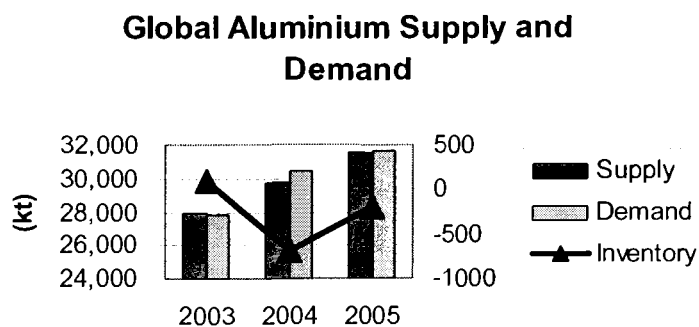
KWS competes globally in the alloyed aluminum billet and sheet industry, focusing primarily on North America and Asia customers.

### 2.1 Macro-Environment Factors

#### 2.1.1 Economic Factors

Improvement in the business climate in developing worlds and a strong demand in many emerging markets like China and India has resulted in growth in demand after several years of weak consumption. Demand and supply are close to balanced and prices have risen as a result of this balance. See Figure 2.1.1. The long-term growth forecast is at 3-4% annually. Yet, aluminum, as with most commodities, has declined in terms of real prices.

Figure 2.1.1: World Primary Aluminum Balance



Source: 2003-2004 Alcan, 2006 CRU, Data from Alcan Investor Workshop Presentation, Dec 7, 2004

Lack of significant differentiation within the industry has led to strong competition and a drive towards lower prices. High fixed costs with lower selling prices are resulting in lower margins, yet investors are demanding economic profits not simply accounting profits. Creating value for both the customer and the investor in a commodity market is a challenge for all primary metal producers.

Due to the amount of energy required to produce aluminum, new capacity will occur in areas with abundant energy resources that are available at competitive pricing. The closeness to mass market consumers will also be a major consideration. Alcoa, in its focus to promote industry growth has made a fundamental commitment to not only forge strong relationships with its customers but also to go where its customers are regardless of their location around the globe. This is in an effort to lower manufacturing costs and to serve customers in emerging markets.<sup>viii</sup>

### **2.1.2 Environmental Factors**

The aluminum industry has been affected by the impact of changes in social values related to the environment. The general public is concerned about sustainability of the environment and is looking to industry for reduction of its environmental footprint. Issues such as air pollution, greenhouse gas emissions and water scarcity are moving to the forefront of investor and consumer minds. Alcan's executive vice president, Richard Evans, challenged attendees of the 2004, 11<sup>th</sup> International Arab Aluminum Conference to work together to promote the positive aspects of aluminum, the main focus being its recyclability. He made the comment, "If we don't get that message across in a convincing and compelling fashion – steel, plastics and other competitors will tell our story for us focusing on the negatives of a single step in the aluminum value chain, such as bauxite mining or smelting."<sup>ix</sup>

The increased environmental awareness is seen not only in consumer attitudes but also in legislation. Environmental pressure is increasing from regulatory sources which are mandated to protect the air, water and wildlife, among other areas of the environment. Big environmental efforts have been made to reduce energy use, gas emissions and non-recycled waste. Emissions of poly-fluoro carbons (PFC) and poly-aromatic hydrocarbons (PAH) from smelters, for instance, have been reduced by about 80% over the past decade. R&D is helping to achieve these breakthroughs.

Environmental pressures have made expansion in developed countries challenging, the expansion of power sources must be done using a method that does not introduce a serious imbalance in the environment. Areas that have a surplus of hydropower have a distinct advantage. Areas such as Iceland, Siberia, and much of South America show the best potential.<sup>x</sup>

The second best environmental option is to generate electrical energy in areas where abundant natural gas exists, like in the Mid East. Environmentally and socially dual benefits exist from this process as it is coupled with desalination. The surplus water is being used to “green” areas that were once barren desert.

The third energy option is thermal power. Countries such as India and China, which have significant coal reserves, can use it to generate thermal power for capacity expansion. This is only an option in areas where less control or emphasis is given to the mass of emissions. Companies must remember that shareholders live around the globe and sustainability is a measuring tool. Many shareholders will not look favorably on companies they believe have relocated to areas where lower environmental standards exist in order to solely exploit this advantage. Many developed world investors want to see companies raise the local standards when they enter emerging countries.

### 2.1.3 Technological Factors

Technology within the aluminum industry has merged with virtually all companies moving towards near identical technology. Developments focus on increasing cell size to increase thermal efficiencies and lower capital costs per installed tonne. Pre-bake technology has proven to be superior and it is the choice of virtually all new capacity.

Soderberg technology is the oldest technology and still exists in plant such as KWS. Environmental and occupational health and safety restrictions are putting pressure on companies to re-invest in pre-bake technology. The health and safety of the smelter worker is improved in the pre-bake environment. The process in a pre-bake environment can be controlled more by computer applications and less human intervention is required.

The highest risk job in a soderberg potline is the manual removal of carbon outs (chunks of the anode that have broken away) from a pot, which results from anode problems. In a pre-bake potline the problem portion of the anode can be removed using a ceiling crane and no manual intervention is required.

The other high risk job with soderberg technology is dealing with anode effects or the job commonly called pot poking. Gas builds up reducing the electrical current in the pot, and an operator must go and manually break the crust on the top of the pot with a pine pole ( 2"x3"x8' piece of lumber) to release the trapped gases and then insert a pine pole completely into the pot to stop the effect. This is a dangerous process as the pole is awkward to hold, the top of the pot is at ground level so the operator is bent over, and the operator is exposed directly to the gases and heat from the pot. Potential exists for an explosion and serious injury if the pole is wet or frozen, (winter time) or the humidity within the pole is too high.

In a pre-bake system anode effects are rare and typically only seen during the start-up of a new pot or occasionally in exception pots. The variables which result in anode effects can be proactively controlled in a pre-bake system by an operator who is located in a computer control room.

Furthermore pre-bake technology impacts safety positively by a dramatic reduction in mobile equipment. Crustbreakers, ore trucks, wheelbreakers, payloaders and trimmers all become obsolete pieces of equipment. Mobile equipment is a leading cause of fatalities within the industry, so the reduction of the mobile fleet is a powerful way to reduce fatalities and accidents.

Old technology can not be used as an excuse for poor safety performance at KWS or any other smelter. The plant within Alcan used as an internal benchmark is Grande-Baie in Quebec. This smelter has sodberg technology yet manages consistently to be a top safety performer in the Alcan system.

#### **2.1.4 Social Factors**

Social expectations exist in terms of health and safety standards for workers around the world. A safe work environment is seen as a right in developed countries. The developed world is taking that same expectation and putting it on companies to ensure their operations in developing countries live up to the same standards, exceeding in many cases the developing countries standards. Social expectations related to the treatment of the environment and the choices of technology used have been discussed above.

### **2.1.5 Political Factors**

Political forces exist in the Primary Metal industry. Governments are responding to changing social and environmental values and creating legislation to ensure workers and the environment is protected.

KWS regularly meets with government representative to ensure KWS is compliance with health and safety standards as well as environmental standards. KWS engages in an ongoing practice of implementing and developing a pollution prevention program. The targets for emissions reductions increase yearly so this is a continual process.

KWS deals with political factors within the communities it operates. The Haisla aboriginal nation requires consultation and involvement in business affairs that affect their community. Concern exists for the sustainability of the fish in the local river system, while at the same time the Haisla are looking for direct and indirect employment opportunities for their people.

The local regional district is concerned about the sustainability of the community and is driven to protect jobs and to ensure the future of the community. Trying to finding a balance that will meet both Alcan's need to maximize value and the Regional Districts desire to protect all jobs is a current challenge for Alcan Inc. and KWS leadership.

A strong conflict exists because a rebuild, which would guarantee KWS remain in the community for another fifty years, would reduce the total number of jobs. The regional district does not see this as an acceptable reality and believes Alcan should build a bigger smelter to maintain the same number of jobs. Alcan has responded to this demand by claiming it is unreasonable to expect the same number of jobs due to the improvements in technology over the last fifty years. Alcan's other option is to not rebuilding at all and close the smelter, as has been



done to other smelters around the world. If this option is chosen it should be expected to occur in the next ten years as the smelter is reaching the end of its life.

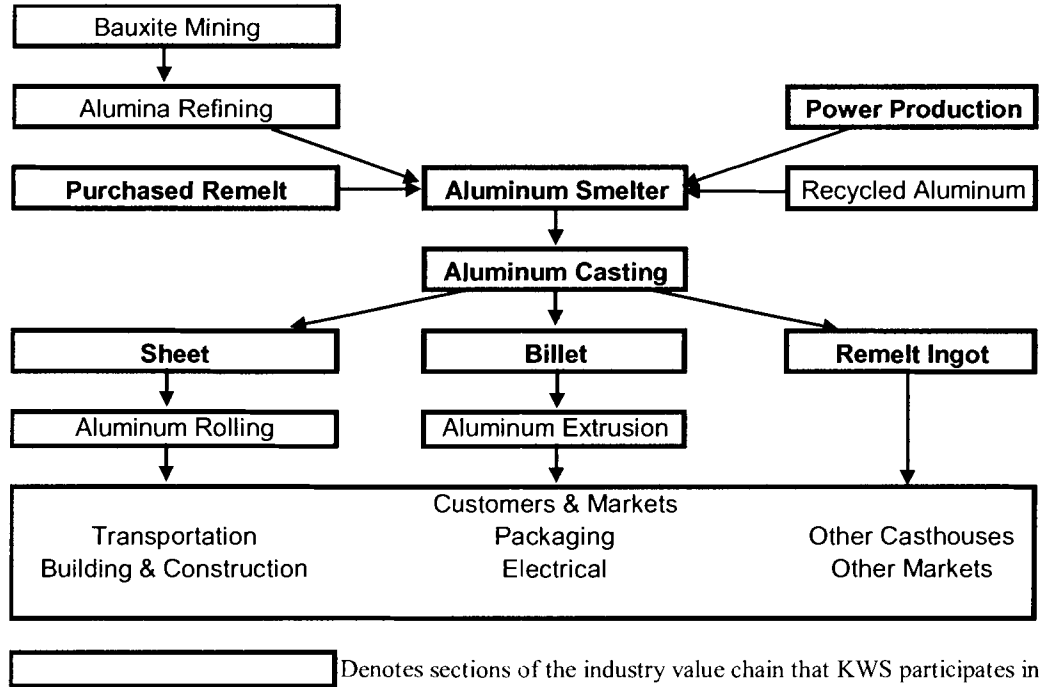
A great deal of fear and uncertainty exists within the community as a result of not knowing which way Alcan will decide. Morale is affected by the state of indecision both inside and outside of the smelter walls. The situation creates a constant daily distraction as employees worry about their future and are often distracted from their jobs. It is highly plausible that the safety results at KWS are directly impacted by this distraction and the damage done to overall employee morale. A decision either way would allow employees to know what the future holds and make plans instead of constantly living in limbo.

## **2.2 Industry Supply Chain**

The Aluminum industry supply chain starts with the mining of bauxite; bauxite is then refined and converted to alumina. Assets specificity exists in this portion of the chain. Alcan Inc. has one business group that focuses on this part of the chain. The Primary Metal Group then takes the alumina and uses it to produce aluminum. KWS smelter has an advantage in that it owns its powerhouse and does not have to purchase electricity from the marketplace. The molten aluminum is then transferred to the Casthouse, which would typically be located beside the smelter, and the casthouse produces the cold metal products which are then sold in the marketplace. Figure 2.2.1 shows the Aluminum Industry value chain and points out the parts of the chain applicable to KWS.

The work in progress is a commodity up until the point that it is alloyed with other metals in the casthouse and then poured to make sheet or billet. It is in this last stage of the value chain that changes the commodity product to value added.

**Figure 2.2.1: Aluminum Industry Value Chain**



Source: Created by author

## 2.3 Porter’s Five Forces

In order to understand the primary aluminum market, in which KWS functions in, an analysis has been done using Porter’s five forces. KWS competes in the production of alloyed aluminum billet and sheet servicing primarily North American and Asian customers. See Figure 2.3.1.

### 2.3.1 Supplier Bargaining Power

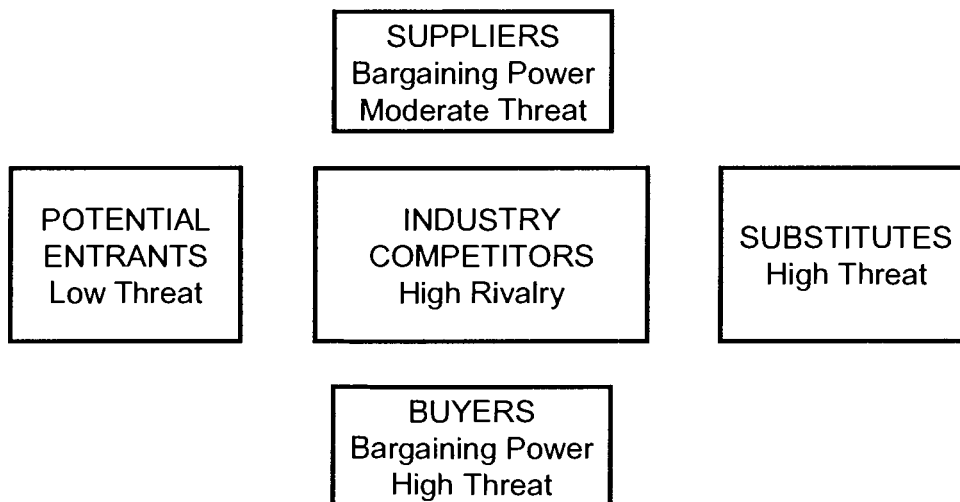
Supplier bargaining power is moderate overall. Raw materials are abundant but costs vary. Energy or electricity costs account for typically close to 30% of the total cost for aluminum production. Potential exists for energy producers to have significant power, but because of the quantity involved aluminum producers are either vertically integrated or engaged in long-term

contracts. No new capacity will be started without a secure energy source in place. This decreases energy supplier's power as a producer can choose to develop capacity in a different location if a favorable energy contract can not be negotiated. Alcan Inc. manages supplier power in terms of energy by owning 62% of its electricity requirements, the KWS powerhouse being one example.

Alumina is the other essential raw material and also accounts for approximately 30% of the total cost of production. Alumina needs to be of consistent quality because the internal smelting process is tailored to handle a particular raw material. For this reason, companies such as Alcan and Alcoa are vertically integrated.

With a minimum of 60% of the total costs vertically integrated or locked into a long-term agreement, plus labour costs which are often fixed due to a union contract, the remaining supplies and materials left to be purchased on the open market are minimal and many are available from multiple sources which aids in limiting supplier power.

**Figure 2.3.1: Porter's Five Forces for the Aluminum Industry**



### **2.3.2 Threats of New Entrants**

The threat of new entrants is low for many reasons. The aluminum industry is very capital intensive and this makes it a very risky industry to enter. Capital costs are high with a 250,000 tonne per year smelter costing \$2-3 billion to build. Being a commodity market the need for economies of scale is critical in order to reduce fixed costs and obtain a cost advantage. A 250,000 tonne smelter would likely be the minimum size required today.

Access to a constant supply of raw materials is also critical to costs and operational efficiencies. Ability to secure raw materials for a new entrant will likely be difficult as many of the producers of raw materials are owned by competing aluminum producers.

The industry is mature with two dominant competitors, so breaking in and obtaining market share for a new entrant will be difficult due to the lack of ability to differentiate and margins are too thin to allow for price slashing to steal market share.

For all of these reasons a new entrant will find attracting financing difficult, putting up another roadblock to entering the market.

### **2.3.3 Competitor Rivalry**

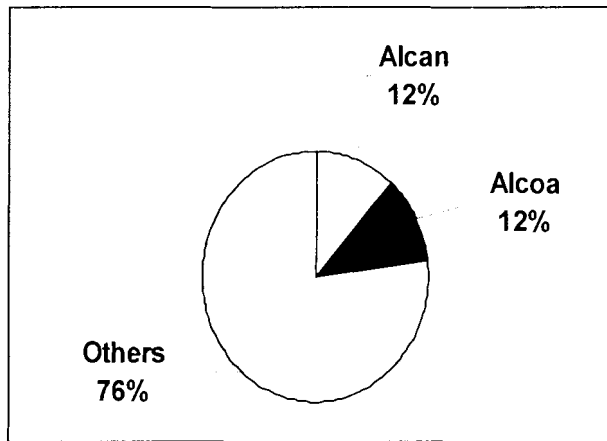
Competition is very high. Aluminum prices are set by the London Metal Exchange (LME). Lack of flexibility in assets and output implies that a company cannot encroach on another's market share without incurring the risk of overcapacity and subsequent falling prices.

This is a mature industry; the market is made up of many firms of unequal sizes. The number of firms is decreasing as mergers and acquisitions occur and unprofitable firms close their doors. Two dominant competitors, Alcan and Alcoa make the industry a competitive monopoly.

Both are global and have many smelters located around the world. Rivalry amongst the two competitors occurs on three fronts, cost, location and quality.

At the end of 2004, after the completion of Alcan Inc.'s acquisition of Pechiney, both Alcan and Alcoa have near identical market share, combined they produce just less than one quarter of the world's production. Refer to Figure 2.3.2.

**Figure 2.3.2: 2004 World Primary Aluminum Production**



Source: Production numbers from Alcan and Alcoa's 2004 Annual reports

#### **2.3.4 Aluminum Substitutes**

The threat from substitutes is very high as numerous substitutes exist for aluminum, the main ones being steel, magnesium, zinc, plastics, glass, paper, copper, and titanium. These outside industries are competing for market presence in many of the same industries as aluminum.

The automotive industry is the major consumer of North American aluminum production and is an area of fierce competition for substitution. The automotive industry is looking for ways to reduce the weight of cars as consumers demand more fuel efficient cars because of rising fuel

prices. Steel is the traditional material of the automotive industry and makes up about 55% of an automobiles total weight. The weight of steel and cost of part manufacturing processes are causing it to be replaced. New technology for steel will be required in order for it to maintain market share. The steel industry has invested heavily throughout the 1990's in helping the automotive industry build better parts and vehicles out of steel rather than using aluminum.

Aluminum and magnesium both want to replace steel for the manufacturing of die cast automotive parts. Aluminum is currently in the lead with demand steadily increasing over the last ten years. As of 2003 aluminum averaged 220 lbs per vehicle compared to only 5 lbs per vehicle for magnesium<sup>xi</sup>. Aluminum is lower in price but magnesium is 30% lighter than aluminum. As magnesium production technology improves and if costs can be lowered aluminum could find it self displaced quickly by this substitute.

The aluminum industry is working to reduce the threat of substitutions by promoting itself as a most favorable option due to the recyclability of aluminum. Alcan is currently the leader in the area of recyclability.

### **2.3.5 Customer Bargaining Power**

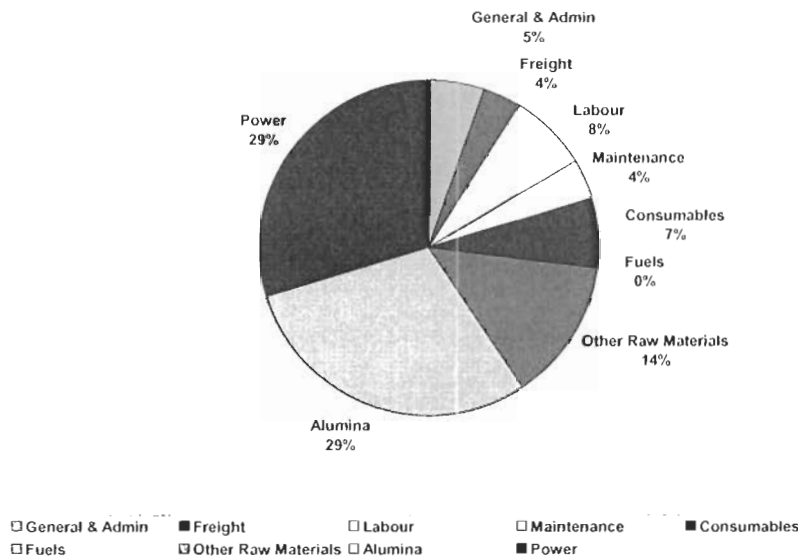
The customer or buyer has significant power. Aluminum is a commodity so product differentiation is difficult, therefore switching costs are not high and this gives buyers their source of power. It is important to remember that customers are price sensitive, particularly those in the automotive industry. Consolidation of the aluminum industry (Alcoa's purchase of Reynolds and Alcan's purchase of Algroup and Pechiney) tend to reduce buyer power, but not substantially. Alcan and Alcoa are the main competitors in the market, but the other three quarters of the world's supply exists from aluminum manufactures also looking for new market share.

Although there is a slight ability to differentiate the product by adding different alloy mixes and providing technical assistance, there is nothing holding back other competitors from doing the same.

## 2.4 Sources of Competitive Advantage

Cost is the most significant competitive advantage an Aluminum producer can strive to achieve. Figure 2.4.1 shows the industry average distribution of operating costs to produce aluminum. The key cost advantages come from power and alumina. Due to the significance of these two components many Primary metal producers chose to be vertically integrated with power and alumina.

Figure 2.4.1: Industry Average Primary Aluminum Operating Costs



Source: Data from 2004 CRU Al Smelting Cost Model

Operational efficiencies are the other means of competitive advantage. The overall goal is to keep variable costs under control and allow for dilution of fixed costs. In older plants, still

using soderberg technology, labour costs can be significantly higher than the industry average.

At KWS labour is closer to 25% of the total hot metal cost. Man-hours per tonne need to be monitored and controlled to keep operating margins at the highest point possible.

Location is another source of competitive advantage. Location advantage can come from being situated beside a vital supplier, such as a power plant or alumina refinery. It can also come from being located close to mass consumers. Plants in eastern Canada and the eastern United States have a location advantage as they are placed close to many automotive suppliers and manufacturers. Being located near a port can also provide a major advantage as product can be loaded directly onto a ship instead of first loaded on to trucks or railcars and then reloaded onto a ship. Aluminum is heavy and the cost of transportation by sea is much more cost effective than transportation over land. KWS has the advantage of being located right on the coastline and has a dock immediately beside its casthouse.

The ability to differentiate ones product is the other major competitive advantage possible. This is also probably the most difficult advantage to achieve due to the commodity nature of the products being produced. Alloys add value to the aluminum but do not give a true competitive advantage as other manufactures can also provide the same product. Producing a high quality product in terms of very specific customer requirements can allow for some differentiation. Controlling the exact percentages of alloy mixes can be technically challenging and expertise is required to cast such products.

## **2.5 Overall Industry Attractiveness**

Overall the North American and Asian alloyed aluminum billet and sheet industry is unattractive. It is extremely competitive. Rivalry is intense with two players dominating. Not only is there competition from other companies, there is competition from several substitute



products which have the potential of posing a serious threat. Buyer power is strong due to low switching costs and lack of ability to differentiate significantly for most companies. Supplier power is moderate due to the fact that most players are vertically integrated and the remaining materials required are available from numerous sources. The threat of new entrants is low. For a new company trying to enter there are sizeable barriers to entry including the amount of capital required due to the need for economies of scale, ability to access raw materials and the ability to obtain market share in a commodity market.

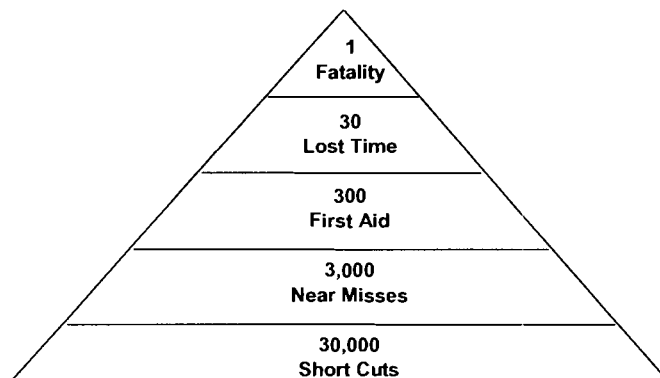
## 3 SAFETY IN THE PRIMARY ALUMINUM INDUSTRY

### 3.1 Industry Safety Philosophy

The philosophy behind safety programs does not vary much between companies or even industries. The first and most common safety philosophy is that all injuries are preventable. Both Alcan and Alcoa share this as their main safety objective and have safety management programs to work towards achieving this target.

The basic safety philosophy approach is based on a safety triangle. It is a simple common theory used to reduce accidents with the focus being on the elimination of short cuts, concentrating on behaviour based safety. The safety triangle represents the ratio of shortcuts to near misses and accidents. The hypothesis is that if you can eliminate shortcuts, the triangle crumbles and accidents are eliminated. See Figure 3.1.1 below for a typical safety triangle.

**Figure 3.1.1: Safety Triangle**



The elimination of shortcuts has employee participation as the key driver of the cultural change, as frontline employee involvement fundamental to changing the safety culture.<sup>xii</sup>

Dupont, a science company, is viewed as setting global standards for safety. DuPont’s safety results are commonly used as a benchmark in the Aluminum industry. DuPont has taken their safety advantage and turned it into a product, by selling programs and training. The DuPont Safety Philosophy is seen throughout the primary aluminum industry. The philosophy is based on 11 safety points. The 11 points are summarized in table 3.1.1 below.<sup>xiii</sup>

**Table 3.1.1: DuPont 11 Point Safety Philosophy**

1. All injuries are preventable.
2. Management, from the top of the corporation to first-line supervisors, is responsible and accountable for preventing injuries.
3. The combined energy of the entire organization is necessary to continuously improve and excel in safety performance.
controlled.
5. Safety is a condition of employment. Each employee must be convinced that he or she has a responsibility for working safely.
6. Each employee must be trained to work safely.
7. Management must audit performance in the workplace to assess safety program success.
8. After an audit is completed, all deficiencies must be corrected promptly.
9. Safety is part of every job, but safety is also part of every person's life.
10. Safety excellence is part of overall competitiveness and is therefore an integral part of all business activities.
11. Safety must be integrated as a core business and personal value.

### **3.2 Industry Safety Programs**

Nearly all companies that achieve excellence in safety all have similar safety management programs containing five basic elements: commitment from management, line management ownership, management involvement in safety activities, comprehensive safety practices and an internal safety organization with safety specialists.<sup>xiv</sup>

The cornerstone or starting point is that management must be committed and have the vision and drive to see the company succeed in safety. This commitment is seen through out Alcan and KWS, by the continual emphasis on safety. Everywhere you go you see and hear about safety performance and initiatives. KWS's lack of success emphasises the fact that even though this key success factor is in place, it is only the starting point and the other drivers of safety performance must also exist.

Line management ownership involves everyone in the company hierarchy, from the CEO down to the individual worker on the floor. It is only when every level of the chain participates by understanding and believing the companies values and goals and converting them into actions that success can be achieved. The weakest point in this chain will be reflected in the safety results, and shows an indication of the safety culture that exists within the company. Culture is the driver that appears to be KWS's weakest point. As the KWS culture is examined this statement will become more apparent.

Involvement in safety activities refers to training, but this is only the starting point in successful companies. Leading companies are increasingly turning to self-management systems to improve their safety performance through tapping the initiative of all their people.<sup>xv</sup> Along with involvement, empowerment of all employees to take action in regards to safety is also considered a safety activity.

At KWS employees are given many opportunities to be involved in safety activities. Crews have daily pre-start meetings which include safety on the agenda, specific safety meetings are also held along with safety training and joint union and company safety committee meetings. All investigations involve management and union representation. This is an element where top management's commitment to safety shows as front line employees are given many opportunities to be involved. The issue comes back to KWS safety culture as perception seems to exist that

although opportunity for involvement exists, empowerment does not and this weakens the impact of the safety activities.

Comprehensive safety practices should result from safety activities and be available for all areas and jobs. Safety practices include safety meetings, safety rules and injury investigation procedures. Safety rules must not only exist they must also be obeyed and enforced or they lose their value. Recognition of safety achievement is also important to encourage all levels of the company of progress being made.

Internal safety organizations and safety specialist provide leadership for safety committees and for overseeing the development of safety activities and training. Interestingly though a survey on safety performance found that some of the very best companies had this work done by the line organization and workers themselves, not safety specialists. Milliken, one of the largest textile companies in the world, and also one of the safest companies in the world, doesn't have a single safety specialist on staff and is committed to self-management of safety activities.<sup>xvi</sup>

KWS has an army of safety specialists. A safety department exists along with safety coordinators in each area. This shows that management is taking the safety problem seriously and is investing resources to solve the problem. The current lack of improvement in safety performance can not be connected to a lack of safety specialists. However, it is possible that money is being invested heavily in the wrong area and may be better spent freeing up more front line workers to participate in self-management and development of safety practices.

In a plant the size of KWS documenting and updating documentation for every possible job is an enormous task, yet other large companies have succeeded and KWS can too. Volumes of documentation currently exist yet not every task has a work procedure to ensure the work is performed not only accurately, but safely.

One area requiring improved documentation is the maintenance group. This area has the most diverse work descriptions. Literally thousands of pieces of equipment exist and numerous types of repairs are required for each. Completely documenting each potential task is a gigantic undertaking. Currently all regularly occurring preventive maintenance work has written procedures but many other tasks do not.

This is an opportunity for frontline employee empowerment in taking on some of these tasks. There is a need for a dedicated individual or group of individuals to work on improving the status of written procedures. KWS supervisors already have a very full job and adding writing additional job descriptions to their workload will only take away from the time the supervisors actually spend supervising. Currently more accidents are attributed to lack of supervision than lack of written procedures.

### **3.3 Risk Management**

The standard safety program concentrates on planning with the purpose of establishing controls with risk management being at the centre of the program. Risk assessment is a continuous activity which involves regular observations of processes and taking corrective action when risks are discovered. Emphasis is not only placed on employee safety but also on contractor safety and outside supplier safety.

The same types of accidents and health issues appear in most smelters, and as a result safety programs and risk management are based around them. The primary focus of safety programs is on potential killers. There are eight common potential killers within the aluminum industry, mobile equipment, energy hazards, band iron, falls, molten metal, confined space, fire and explosions. These same eight account for the major causes of recordable injuries. Minor

injuries, in particular hand and finger injuries, and burns are also a major focus due to the total volume of incidents.

A businesses ability to deal with and understand risk determines whether the business is going to end up with a reactive or proactive safety program<sup>xvii</sup>. Risk is described as having four dimensions. For example the Alcan Inc. EHS program breaks risk factors down to the environment, systems, experience and culture. All four must be continuously considered so that a complete risk profile can be created that reflects the true nature of the business and allows quality business decisions to be made.

### **3.3.1 Environment**

The environment in terms of risk refers to various components. The physical environment includes the site, equipment, materials and the general immediate working environment. It also includes the contextual environment and this can be harder to analyze for risk. Labour relations, political and social issues, technology and knowledge of employees all have impact on the environment. Even the market and general economy can have an affect on the internal environment and the achieving of objectives.

Efforts have been made over the last few years to improve the working environment at KWS. Emphasis has been placed on housekeeping and efforts have been made to improve workflow. This has had a positive impact on areas where the efforts are complete. This process will continue for sometime to come as it is only possible to address a few areas at a time due to limited resources. Currently the separation of pedestrians and vehicles is also underway and the goal of this initiative is driven by the need to reduce risk within the work environment. This initiative will be discussed in detail later on.

### **3.3.2 Systems**

Corporations have many systems, all of which influence safety objectives intentionally or unintentionally, and both positively and negatively. Obvious systems include ISO systems and EHS Management Systems, but financial systems and reward systems have influence as well. Care must be given to the way financial results are reported and credit is given to ensure added risks are not taken to achieve financial objectives. Reward systems must line up with EHS systems to again avoid the temptation of taking avoidable risks such as short cuts.

Alcan staff performance bonuses used to be solely based on production and financial targets. This has changed gradually the last few years with each revision to the system placing more emphasis on the environment, health and safety results. Each KWS staff personally felt the effect in 2004 as bonuses were negatively impacted by poor safety performance. Unfortunately this system is only in place for staff and so unionized employees did not personally experience the impact.

### **3.3.3 Experience**

The past experiences of a business can have significant impact on the risk profile of the business today. A major loss such as an accident, fine or legal action influences a businesses ability to achieve today's objectives. The experience of leadership is also critical to the level of risk profile.

KWS has been in operation for over fifty years and many employees are nearing retirement and have spent their entire careers at KWS. Their fathers worked here and their children work here. The importance of experience can not be overlooked. Unfortunately all of this experience has resulted in an attitude that "accidents happen," and that taking risk is part of the job. This depth of experience makes change difficult as there is a resistance to change work



practices that have been around for decades, particularly when tasks are added which result in a job taking longer to complete than in the past.

### **3.3.4 Culture**

Culture can be the most difficult dimension of risk to determine its influence. It deals with softer intangible elements that affect the contextual environment. Corporate culture is the result of many forces including corporate values and beliefs, ethics, perceived norms and assumptions, fear, risk tolerance, competitive spirit and management style. Even items such as the product(s) the organization produces, technology, competition and desired position with the company can influence culture.<sup>xviii</sup> Culture begins early in a company's history and serves as the glue that holds the organization together. The attitudes within the corporate culture are reflected in the organizations safety culture.

#### **3.3.4.1 Safety Paradigms**

A safety culture must be built on an understanding of the causes of unsafe acts. Two major paradigms exist, that are not necessarily mutually exclusive, and both serve as guides to improving safety culture and reducing errors: the normal accident theory and the high reliability theory.

The normal accident theory states that accidents and errors are normal and to be expected, they are natural consequences when problems exist. The attitude that errors and accidents are abnormal developments, "it won't happen again" needs to be rejected. Attention must be directed to the cause of the problem or error so that safeguards can then be put into place so that incidents don't reoccur. It is through the elimination of holes in a company's defences that improved safety results. The theory goes further and categorizes the "holes in defences" as two types: Active failures or the performance of unsafe acts, and latent conditions which are

related system or procedure design flaws, emphasising the fact that the best people can make the worst errors as a result of latent conditions<sup>xix</sup>.

At KWS there is an acceptance that accidents have causes which can be identified and corrected. The current safety policy requires immediate investigations of accidents to determine causes and to identify the corrective actions required to prevent the incident from reoccurring. This should be an area that KWS can say success has been achieved, yet there is a perception that this is not occurring.

Alcan Inc performs a global employee survey annually amongst its employees. The KWS results to the statement: "Where I work we act quickly to resolve health and safety issues", had 56% agreeing in 2002, 49% in 2003 and 52% in 2004. DuPont asked a similar question in a safety culture survey<sup>xx</sup> performed with a variety of US companies. Their results show that the average response amongst companies considered safe to be 75%, and the average response from companies considered unsafe to be 36%. KWS is sitting in the middle of the two averages. Improvement can be made in this area, although improvement is not likely required to the process itself, but to the communication of the process to ensure all employees know that actions are being taken.

Communication was another weakness brought out by the results of the Alcan global employee survey. At KWS the response to the statement "At Alcan effective communication contributes to my commitment to the organization" saw 31% agreeing in 2002 and 2003, and an improvement to 38% in 2004. The KWS response to the statement "My manager/supervisor creates a work environment of openness and trust." Had a slightly better agreement rate of 39% in 2002, 37% in 2003 and 41% in 2004.

The other paradigm is the High-Reliability Organization Theory which was developed by a group of social scientists at the University of California at Berkeley based on their field studies

of high-risk organizations. The viewpoint is based on the belief that “humans who operate and manage complex systems are themselves not sufficiently complex to sense and anticipate the problems generated by the system. However, proper organizations of people, process, and technology can handle complex and hazardous activities”.<sup>xxi</sup>

High-risk organizations were examined and the following characteristics were identified in these reliability-enhancing organizations

1. People must be helpful to and supportive of one another
2. People must trust one another
3. People must have friendly, open relationships emphasizing credibility and attentiveness.
4. The work environment should be resilient and emphasize creativity and goal achievement, and it should provide strong feelings of credibility and personal trust.

The importance of trust is a reoccurring theme throughout the industry and is discussed in next section.

#### **3.3.4.2 Industry Cultural Issues**

Safety cultures within the industry have changed over the years due to financial pressures from the global market place. Some changes have been positive and others have been more challenging to address. One very positive change has been the realization that a first-class safety program is good for the bottom line. When this belief starts with top management and extends downwards critical inertia is available to assist in offsetting the negative changes with the organization.

One challenge that has increased risk is the fact that the Aluminum Industry has changed its organizational structure in effort to reduce costs. Downsizing during the late 1980's and early 1990's has left companies flatter. Businesses have a small core of permanent workers and a large

contingency of short-term or temporary contract employees. The temporary work environment provides little opportunity to create mutual trust between the company and its workers. This is one obstacle that must be overcome since the successful creation of a safety culture is believed to be based on mutual trust and shared perceptions of the importance of safety and confidence in the efficacy of preventative measures.<sup>xxii</sup>

KWS has experienced these types of changes, the workforce has been decreasing and particularly for non-union positions, more temporary positions are being created or work is being contracted out. Trust was addressed in the Alcan Global Employee Survey; two questions were asked pertaining to trust. The results speak loudly. For the last three years only 37% of employees agreed with the statement: "Where I work employees contribute to an atmosphere of trust and transparency in the workplace." The response was only marginally better to the statement, "My manager/supervisor creates a work environment of openness and trust," with 39% agreeing in 2002, 37% agreeing in 2003 and 41% agreeing in 2004.

The other cultural problem is that changing culture is a difficult time-consuming process; cultural inertia can get in the way of change. Customs and norms continue in spite of attempts by outside forces such as safety professionals, WCB, OSHA, and insurance carriers to change them.<sup>xxiii</sup> The attitude towards change influences the speed in which a company can proceed. An effective change management strategy will be critical to making improvements to KWS's safety culture.

In order to change the safety culture coaching becomes another important part of the task. Good coaching will provide a method of establishing or in some situations re-establishing trust and communication between management and employees. By ensuring managers and supervisors have proper coaching skills the likelihood of successful change management also improves.

### **3.4 Safety as a Competitive Advantage**

Safety must be view as more than another expense a company must incur in order to meet a regulatory requirement. Positive safety performance is good for business and can be a method of obtaining a cost advantage. The Aluminum industry is recognizing that the bottom line is impacted favourably by better-quality safety practices. Injuries cost money, and their cost undermines competitiveness.

Effective safety programs make sense as part of an overall cost competitive business plan. Saving come in the form of reduced workers' compensation premiums, lower equipment damage, less production downtime, reduced need for replacement workers and less risk for prosecution and fines. In an industry where cost is the major competitive advantage it pays to focus attention on safety.

Companies with reputations for the best safety results are also top performers financially, for example DuPont, Milliken, Abitibi-Consolidated, S&C Electric Canada and Shell Oil. Whether or not a true link exists is difficult to prove quantitatively due to the impact of intangible costs and benefits. A standard cost-benefit analysis would assume that an equilibrium point exists when it is no longer cost effective to continue to invest in safety, yet this allows the belief that it would be to costly to eliminate all accidents to slip into business strategies.

Intangible costs and benefits are difficult to estimate and impossible to measure. For example the impact of decreased moral on the production process or on the quality of production can not be predicted. Employees remaining at work, who are thinking about their injured co-worker, are not going to be as capable as they should be, and are more likely to make mistakes along with potentially injuring themselves. Superior safety performance should be considered a competitive advantage and the importance of it not overlooked.

### 3.5 Aluminum Industry Benchmarking

The Institute of the Aluminum Industry (IAI) performed a global safety performance benchmark study involving 92 smelters, 30 refineries and 11 mines. Data was collected from 1997 to 2004. Global aluminum industry data referred to below comes from the IAI study<sup>xxiv</sup>. Both Alcan and Alcoa took part in the study. The study looked at the typically reported safety statistics along with detailed analysis of fatalities.

Within the aluminum industry there are four main statistics which are measured and reported externally and numerous others that are monitored internally. The reported statistics are linked to the top three levels of the safety triangle and include the frequency of recordable incidents, the frequency of lost time incidents along with their severity, and the number of fatalities. The most common ratio is calculated based on per 200,000 hours worked, which is the equivalent to one hundred full time employees and reflects the frequency of the event occurring. One million hours worked is the other common calculation, generally used when summarizing a group of facilities or companies. The IAI Benchmark study is in million hours worked. The standard formula for calculating safety frequency ratios is:

$$(\text{Number of Cases}) / (200,000\text{hrs}) / (\text{Hours of Exposure})$$

Fatalities are not characteristically seen as a frequency ratio but if a ratio is calculated it is seen based on 100 million hours worked. Due to tragic nature of a fatality the number is reported as the number of fatalities per year for the company, with a breakdown between employees and contractors killed on company property. In 2004 Alcan experienced four fatalities, three employees and one contractor. Alcoa experienced three fatalities, two employees and one contractor.

The 2004 Benchmark study by IAI reported 10 fatalities for the industry and a five year moving average 4.4 fatalities per 100 million hours worked for the aluminum industry. Aluminum smelters experience the lowest frequency rate at 4.0, followed by refineries at 5.1, and mines at 6.9.

Lost time accident frequency refers to a situation where an employee is unable to return to work in any capacity. Along with the lost time ratio the total number of lost days is also reported. The total number of lost days is referred to as the Severity rate and provides insight into the seriousness of the accident by providing the amount of time an employee is unable to perform any work task. Once an employee is able to return to the workplace, even if the functions performed are restricted, he or she is no longer included in the severity ratio.

The lost time frequency ratio has dropped 55% from 2000 to 2004 for the global industry, however the severity rate has been increasing. The Aluminum Industry reported a 2.1 frequency in 2004 with a severity rate of 67 per million hours. Smelters had a similar frequency ratio of 2.5, but experienced a severity rate of 78.

Globally in 2004 Alcan reported 3.5 for lost time frequency and 240 for severity while Alcoa reported an impressive .45 for frequency and 45 for severity per million hours worked.

The last ratio is the frequency of recordable incidents or frequency of first aid visits for a work related injury or sickness. This ratio does not necessarily reflect every visit to first aid.

For the global industry Recordable have dropped 60% to 8.7 recordable injuries per million hours from 2000 to 2004. Globally Alcan and Alcoa posted similar results for 2004 of 9 and 8.4 visits respectively. A summary of the statistics above and the sources is listed below in table 3.5.1. A review of the statistics shows that Alcoa has a significant competitive advantage in terms of safety over Alcan. Alcan is experiencing close to the same number of accidents, but

they are much more serious than Alcoa's. Alcan has made huge improvements in safety but still has a long way to go to catch Alcoa.

**Table 3.5.1: Industry Safety Results (per 1,000,000 hrs worked)**

	Alcan*	Alcoa**	Global Aluminium Industry***
Year	2004	2004	2004
Fatalities	4	3	10
Employees	3	2	
Contractors	1	1	
Lost Time	3.45	0.45	2.1
First Aid / Recordables	9	8.35	8.7
Severity/Lost Days	240	45	67

Sources: \* Alcan 2004 Year End EHS First AIRS Report, \*\* Alcoa 2004 Global Sustainability Report, \*\*\* IAI Aluminum Forum, Safety Performance in the Global Aluminum Industry Presentation by Willy Bjerke.

Other common measures tracked internally but not typically reported publicly include the number of medical aid visits, the number of days of restricted work, and the number of high potentials or near misses. These statistics are focusing on the bottom of the safety triangle.

### 3.5.1 IAI Fatal Accident Analysis

The IAI as part of the benchmark study has analyzed fatal accidents from 1997 to Q2 2004, focusing was on what types of accidents result in fatalities for the aluminum industry. The data analyzed included the three segments from the value chain, bauxite mines, alumina refineries and aluminum smelters.

From 1997 to 2004 65 accidents were reported which resulted in 68 fatalities. The accidents were 35% related to mobile equipment, when cranes and hoists were added to the stats 50% of all fatalities were then included. When the specific types of equipment were analyzed only 30% of it was industry specific, the remaining equipment was generic equipment seen in



many other industries. The one single piece of equipment responsible most frequently for fatalities was the forklift, which is the most common piece of mobile equipment within the aluminum industry.

The causes of the injuries were broken down into principle direct causes and root causes. The direct causes were improper use of the equipment, poor guarding and defective equipment. The principle root causes were inadequate rules and procedure, and poorly designed and engineered equipment. As a result of this study recommendations have been made to the industry for the establishment of vehicle pedestrian programs which concentrate on eliminating interfaces between two or pieces of mobile equipment or pedestrians to reduce risk of these types of accidents from occurring.

Both Alcan and Alcoa are currently focusing on vehicle pedestrian programs and KWS is currently in the process of implementing changes in this area as part of its best practices.

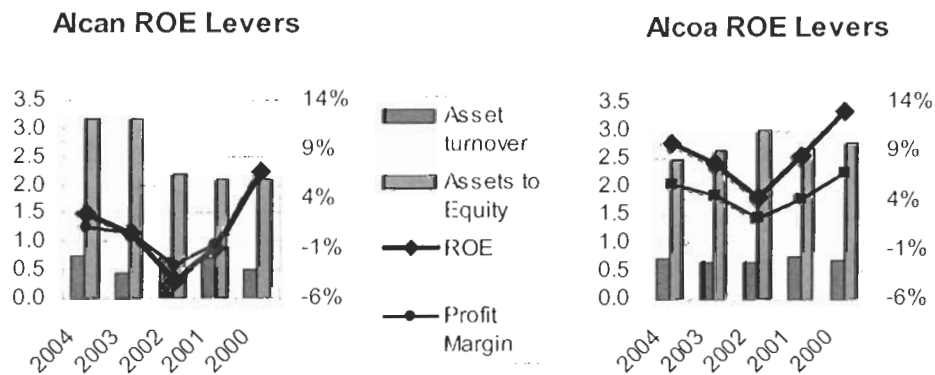
Included within the IAI recommendations was an Area Hazard Assessment Worksheet which provides a systematic approach to identify risks in each mobile equipment and pedestrian interface. This worksheet is included at the end of this report as Appendix 1.

## 4 INTERNAL ANALYSIS

### 4.1 Financial Analysis

Alcoa is not only achieving superior safety results, it is also achieving healthier financial results. Alcoa's ROE has been higher than Alcan's for the last five years. See Figure 4.1.1. The lower ROE is the result of Alcan having a lower net profit margin in each of the last five year, a lower asset turnover ratio in three of the five years, with 2002 and 2004 being only slightly higher than Alcoa's, and lower leverage or asset to equity ratio up until the merger with Pechiney which started in 2003.

Figure 4.1.1: Financial ROE Levers for Alcan and Alcoa



Source: Data from Alcan 2004 Annual Report and Alcoa 2004 Annual Report

In order for Alcan to become the leader in the industry it must concentrate on lowering costs and increasing productivity of its assets. Improving safety results will positively impact both levers. Reduced injuries equals reduced operating costs which will improve the net profit

margin, and a decrease in production downtime and / or damaged equipment will improve asset turnover.

Alcan promised shareholders in 2001 that it would double shareholder value in five years. The target is approaching and to date no significant increases have been seen in profitability. Share prices have dropped each year and since the spin off of Novelis at the end of 2004 share prices have plummeted. ROE has improved since 2001 from being negative (-0.93%) to be positive at the end of 2004 (2.44%), but it still lags behind Alcoa's 9.85% at the end of 2004.

## **4.2 Competitive Position**

Currently Alcan is number two behind Alcoa in financial performance, and is virtually equal to Alcoa, since the Pechiney merger, in terms of market share. Synergies are expected from the merger and Alcan has the desire to overtake Alcoa as the leader in the industry. Every opportunity to increase Alcan's competitive position must be exploited for this to occur.

Alcan's competitive position has improved with the Pechiney merger not only in terms of market share, Pechiney brings to the amalgamation superior technology. This technology combined with Alcan's very high reputation for technical support and reputation for providing a high quality product sets the stage for a strong competitive advantage.

When you compete in an industry where cost is the most significant competitive advantage, you are dealing with very thin margins. Every cost saving opportunity must be fully investigated and pursued wholeheartedly. There is evidence that this is what Alcan is concentrating on as the net profit margin has increased over the last four years. Alcan's average cost of hot metal production is 7.5% below the world average of \$1250/tonne, or \$1,157/tonne which sits in the middle of the second quartile. Alcan has leveraged its unique energy position,

owing 62% of its energy sources and also leveraged its technology resulting in many efficient, low cost facilities.

Continuous improvement is required for Alcan to sustain its current competitive advantage. Steady consolidation of the industry makes market position and market share a difficult item to hold on to. If Alcoa chooses to grow with an additional merger or acquisition Alcan would be placed in a position where it would have to consider the possibility of another acquisition or Alcan would need to look inward for the growth required to hold its position, either by building new facilities or expanding capacity of existing sites. Growth can not and should not take place just for the sake of growth. Shareholders will be looking for a payback and proof of improved financial health as a result of the investment.

Alcan's position as a technology leader is currently strong, but care must be taken to hold on to this advantage. Research and development is a long term commitment, and careful attention must be paid to ongoing legal, environment, health and safety requirements. Newer technology is cleaner and more energy efficient. Pressures will increase from society and governments to ensure that Alcan is following up on its commitment to reduce its environmental footprint.

The conversion of existing Alcan sites to the newly acquired Pechiney technology will be costly, detailed analysis will be required to determine the economic value added advantages of such upgrades. Lowered operating costs, in particular energy savings, along with reduced costs related to health, safety and the environment will need to be significant enough to justify the expenditure to shareholders.

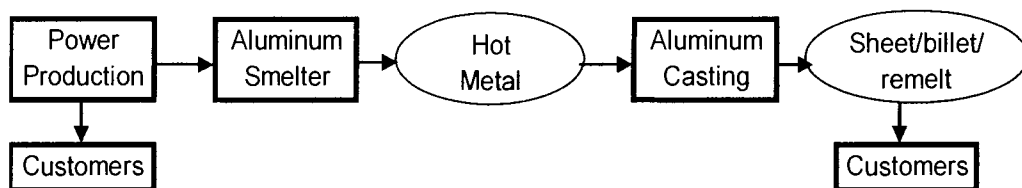
### 4.3 Kitimat Works Value Chain

In order for Alcan to continue to be competitive globally, each and every one of its operations must be competitive. There is no room in the industry's thin margins for supporting EVA negative facilities. KWS is no exception, and KWS must work diligently to prove that it is not only a viable operation, but a profitable one worthy of continued and additional investment. Due to the age of KWS critical decisions must be made in the relative short term regarding its future. Each segment of KWS must make every effort to add value to the operation.

KWS is made up of three main business segments, the Power House in Kemano, the Smelter, or Reduction area, and the Casthouse House.

At KWS value creation occurs predominately at each end of the value chain. See Figure 4.3.1.

Figure 4.3.1: Kitimat Value Chain



#### 4.3.1 Power Production

KWS produces power which is mostly sent to the smelter and the excess is sold to outside customers. The amount of excess power available for sales is largely dependant on the amount of water in the Kemano reservoir. KWS has a long term agreement with BC Hydro for selling excess power.

### **4.3.2 Aluminum Smelter**

The KWS aluminum smelter is the most difficult part of the value chain to evaluate as a stand alone entity. Major inputs come in at a transfer price and the output goes out at a transfer price which includes the cost of converting the hot metal to remelt, a step which doesn't actually occur. The transfer price is set at the three month LME rate. It is in this segment that you see the true impact of being part of a commodity market, since no differentiation is possible at this point, and cost is the only possible advantage. It is at this section in the value chain that financial implications of improvements to health and safety will be the most obvious. Any improvement to asset turnover or operational efficiency will improve the EVA of the smelter portion of the value chain.

### **4.3.3 Aluminum Casting House**

The last step of the KWS value chain is the cast house. It is at this point that several value added opportunities exist due to the fact that along with a cost advantage a differentiation advantage is now also achievable.

The hot metal is delivered to casting where it is placed in furnaces and alloyed with complementary metals and then poured into either sheet or extrusion ingot, to produce the value added products requested by customers. The price of the finished product is now more flexible as only the base price comes from the LME. Customers then pay an additional premium for the additional alloy mix and final form of the product.

By striving to differentiate it self from other casthouses in terms of the specialty products it makes, a competitive advantage is achieved but the cast house cannot waiver from the never ending task of cost control. There are several casthouses around the world providing similar

services and if the customer can purchase the item for a lower premium elsewhere they will. It is important to remember that switching costs for customers are negligible.

Providing superior customer service and technical assistance is required for KWS to continue to maintain its customer base for value added product. KWS casthouse employees regularly travel to customer sites in order to maintain customer relationships.

Increased asset turnover and operational efficiencies add value quickly to the Cast house. The elimination of breakdowns, schedule delays and work stoppages all add to the profitability of this and every other part of the value chain. Improving safety in the cast house will increase asset turnover and increase profit margins.

#### **4.4 Current Kitimat Works Strategies**

KWS is working hard to maximize value and justify its position within the Alcan system, yet the results for 2004 were disappointing on nearly every front. A review of the current strategies and objectives is necessary to try to determine why the overall results were poor.

##### **4.4.1 Maximizing Value in Kitimat**

The primary objective for KWS is the same as every other smelter in the Alcan system, maximizing value. Each fall a budget is prepared and an EVA for the coming year is committed to. For 2004 Kitimat committed to achieving an EVA of \$23.7M. At the end of 2004, adjusting for exchange and changes in the LME to allow for a true comparison of controllable items, an EVA of only \$20.3M was actually delivered, fourteen percent below the target. Several factors impacted the results.

Hot metal costs for KWS was 7% below the Alcan average of \$1075/tonne, but the 2004 target for KWS was \$1049/tonne. Due to the total volume of metal produced at KWS, this \$26

per tonne over expenditure on hot metal would have negatively impacted on the bottom line by \$6.3 million, had the budgeted production plan been achieved.

KWS had a set a 2004 production budget target of 246,200 tonnes for hot metal and 244,600 tonnes of cold metal production, the variance being a natural consequence of the casting house process. The year finished with hot metal production being down 2000 tonnes, largely due to process problems.

On a positive note the cast house produced 253,900 tonnes of cold metal. The additional metal resulted from the cast house buying outside remelt to process to achieve extra production. The supplementary production was in the most profitable product line, 12,400 tonnes of sheet was manufactured above plan. Because of the premiums resulting from sheet, and the need to meet long term customer demands, the business decision to purchase remelt to offset the hot metal shortfall was a sound one.

#### **4.4.2 Environmental**

The 2004 environmental results were a high note for KWS. All internal objectives were met and exceeded. An important milestone was reached with the completion of the first five-year Pollution Prevention Plan (P2 Plan). Fifteen pollution-reduction opportunities and 12 information gaps were identified. The intent was to exceed regulatory compliance, by reducing or eliminating pollutants at-source. Action has been taken with respect to all 15 P2 opportunities. In eight cases, improvement targets have been reached, and Alcan B.C. is on-target to achieve another two (completion dates extend beyond 2004). Efforts continue with respect to the other five opportunities, which have been rolled into the P2 Plan for 2005-2009.



The Alcan's Environmental Improvement Program is also continuing to move forward. The program is taking the results of focused studies on the underlying causes of regulatory non-compliances and moving beyond compliance. Currently the program is focusing on implementing technological and procedural changes to avoid future non-compliances.

#### **4.4.3 Safety**

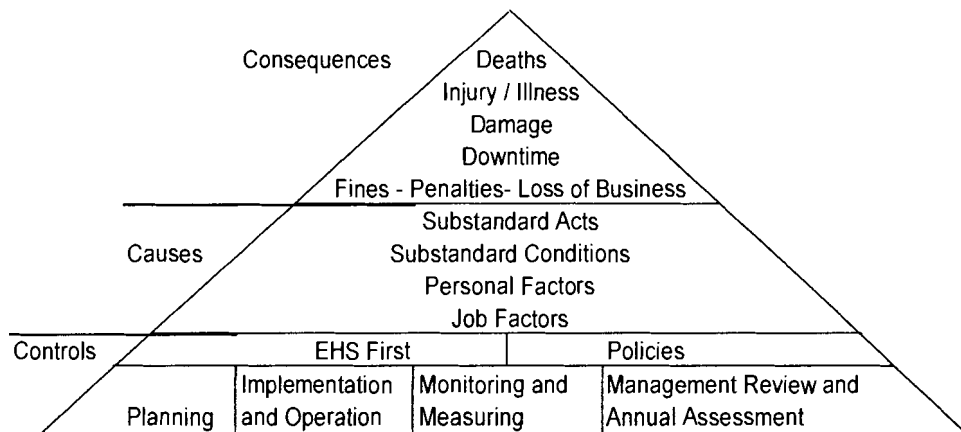
KWS's 2004 safety results were the most disappointing of all. The lost time injury frequency was ninety-one percent higher than target and recordable were twenty percent higher than target. Fortunately no fatalities were experienced at KWS. Looking at the safety triangle and at the results statistically for KWS it was only luck that has prevented a fatality from occurring at KWS. More effort is required in the area of safety to improve results and is the focus of the remainder of this paper.

## 5 KITIMAT WORKS SAFETY STRATEGY

### 5.1 Current Safety Strategy

The current KWS safety strategy mirrors the Alcan model. EHS first is cornerstone of the program. Within the EHS First program Alcan has created its own safety triangle, using the standard safety triangle as only the tip. Refer to Figure 5.1.1.

**Figure 5.1.1: Alcan Safety Triangle**



Source: Data from Alcan EHS First Site Leadership Workshop Manual. Page 4.4

Alcan's Triangle is made up of three C's: Consequences, Causes and Controls. At the top deaths, injuries, and illness are consequences or symptoms of the underlying problem. The second part of the triangle contains the consequences, or the illness that needs to be treated. The bottom level, controls, is the believed cure for the illness. The same safety philosophy applies as

with the standard safety triangle, take care of the bottom of the triangle and the rest of the triangle will crumb.

### 5.1.1 KWS Current Safety Performance

KWS had a total of 974 injuries in 2004. This means two to three individuals are injured each day at KWS. The frequency ratio for recordables at KWS was 5.4 in 2004 or three times the Alcan Inc. ratio of 1.8 per 200,000 manhours. The frequency ratio for lost time injuries was 1.8 or 2.6 times higher than the Alcan Inc ratio of .69. Not only did KWS have more injuries, the injuries were much more serious with KWS severity of lost time injuries being 54 compared to the Alcan Inc. severity rate of 48 days.

KWS's 2004 results are compared with Grande-Baie, Alcan Inc's top safety performer, Alcan Primary Metal Quebec and the United States, and Alcan Inc. below in Table 5.1.1. These are scary numbers and the statistics prove the only reason KWS has not experienced a fatality is pure luck. Immediate action is needed to prevent a fatality from occurring. Fortunately management recognizes and agrees with this conclusion and is looking for every opportunity to improve the situation.

**Table 5.1.1: KWS 2004 Safety Performance v. Other Alcan Smelters (per 200,000 hrs worked)**

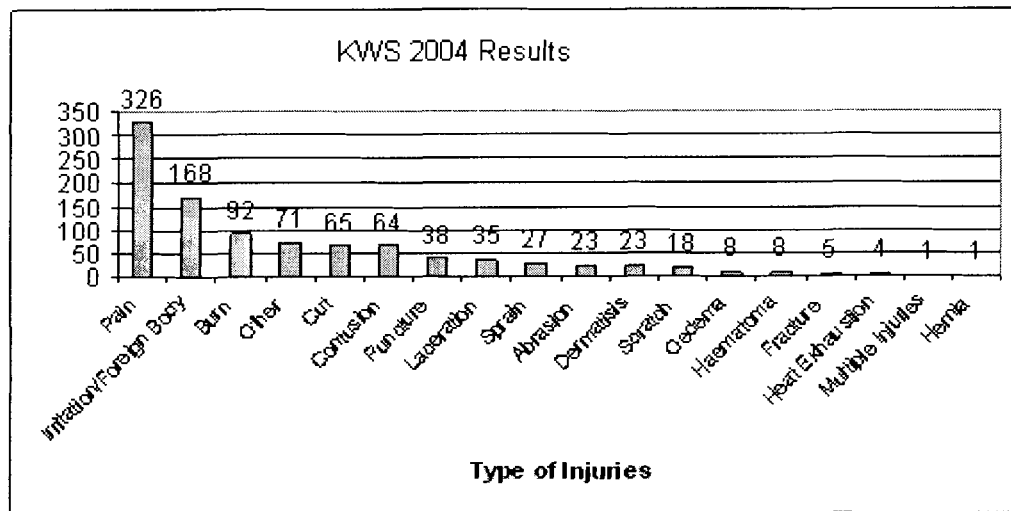
	KWS Avg	Grand-Baie*	APM Quebec and US*	Alcan Inc
Year	2004	2004	2004	2004
Fatalities	0	0	0	4
Lost Time	1.8	0.5	0.9	0.69
First Aid / Recordables	5.2	2.8	3.5	1.8
Severity/Lost Days	54	2	50	48

Source: \*Alcan April 2005 Corporate Safety Department Performance Report

The KWS's safety department tracks all of the safety statistics and compiles the results of the accident investigations and root tree analysis into eight different categories. Emphasis is on the types of injuries, the parts of the body injured, the source and type of contact that resulted in the injury and the causes. The causes are then broke done into immediate causes which are personal or directly related to the action of the injured party, immediate causes that are equipment related, basic causes which are related to the action or inaction of the organization, and basic causes which are related to the injured individual.

In 2004 the most common type of injury reported was pain (33%), followed by an irritation/foreign body (17%) and thirdly burns (9%). A Pareto for 2004 injury types is below in Figure 5.1.2.

**Figure 5.1.2: KWS 2004 Injuries by Type Pareto**

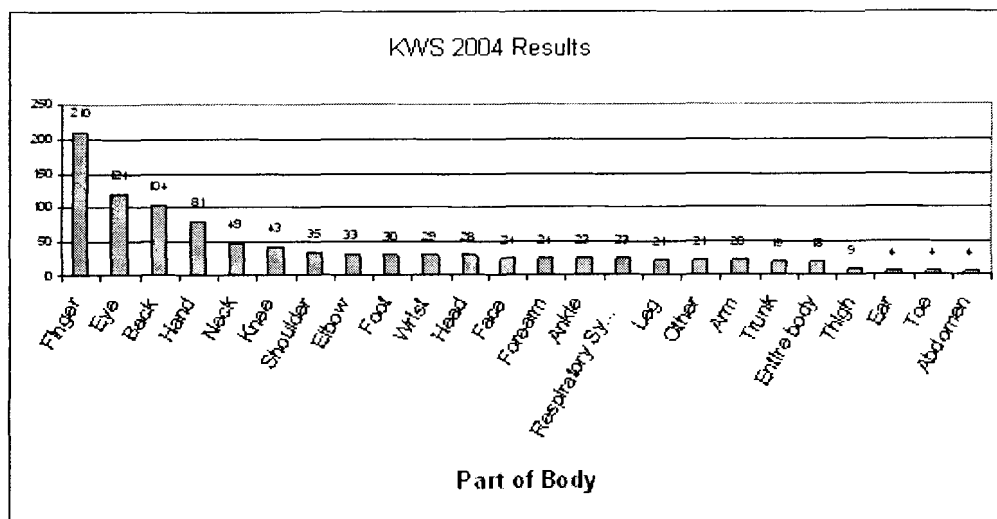


Source: KWS KKOHS Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.

The part of the body most regularly affected was the fingers. Finger injuries accounted for 21% of all Kitimat injuries, add the hand injuries and you are up to nearly 30% of all injuries. This is a problem throughout the industry. Although finger injuries are not likely fatal, the total

volume of them makes this a significant concern and focus. The Pareto for injuries by the part of the body is below in Figure 5.1.3.

**Figure 5.1.3: KWS 2004 Injuries by Part of the Body Pareto**



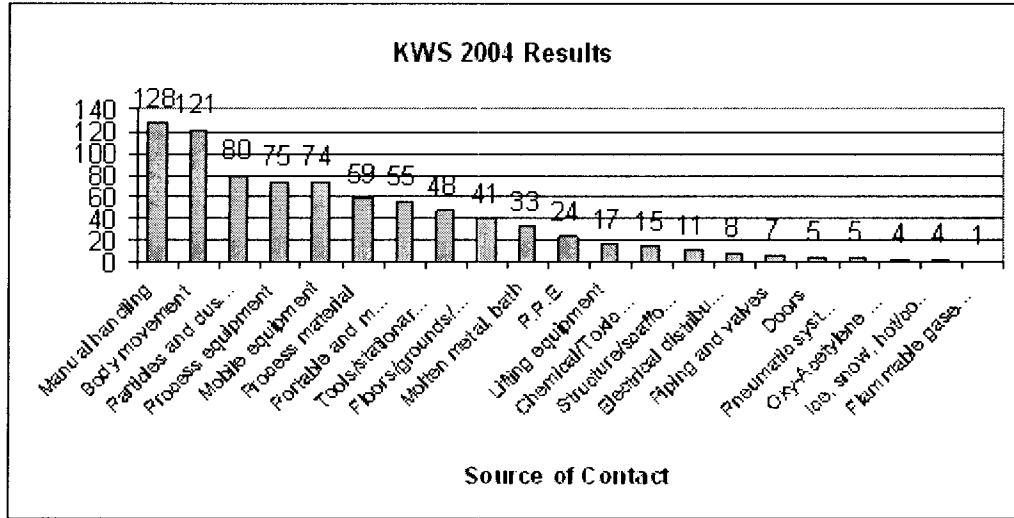
Source: KWS KKOHS Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.

The leading source and type of contact resulting in injuries is not surprising once you know the injury type and part of the body affected. The most common sources of contact are manual handling and body movement, which explains why finger and hand injuries are so common. The most common type of contact is physical effort which is also completely connected to manual handling and body movement. KWS 2004 Pareto's for source of contact and types of contact are below in Figures 5.1.4 and 5.1.5.

KWS, because of its technology, has a significant number of manual processes yet this cannot be allowed to be an excuse for poor safety performance. The smelter in the Alcan system with the best safety results is Grande-Baie in Quebec which has a very similar technology to KWS. Grande-Baie sets the Alcan standard and is the plant other Alcan smelters benchmark

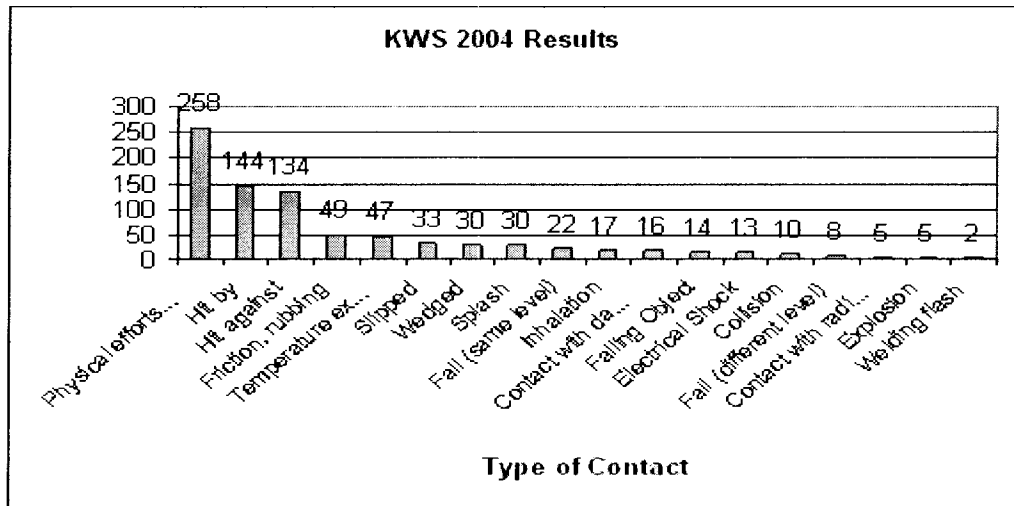
themselves against. In 2004 Grande-Baie had a lost time frequency of only .5, less than a third of KWS's ratio and a recordables frequency of 2.8, slightly over half of KWS.

Figure 5.1.4: KWS 2004 Source of Contact Pareto



Source: KWS KKOH&S Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.

Figure 5.1.5: KWS 2004 Type of Contact Pareto



Source: KWS KKOH&S Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.

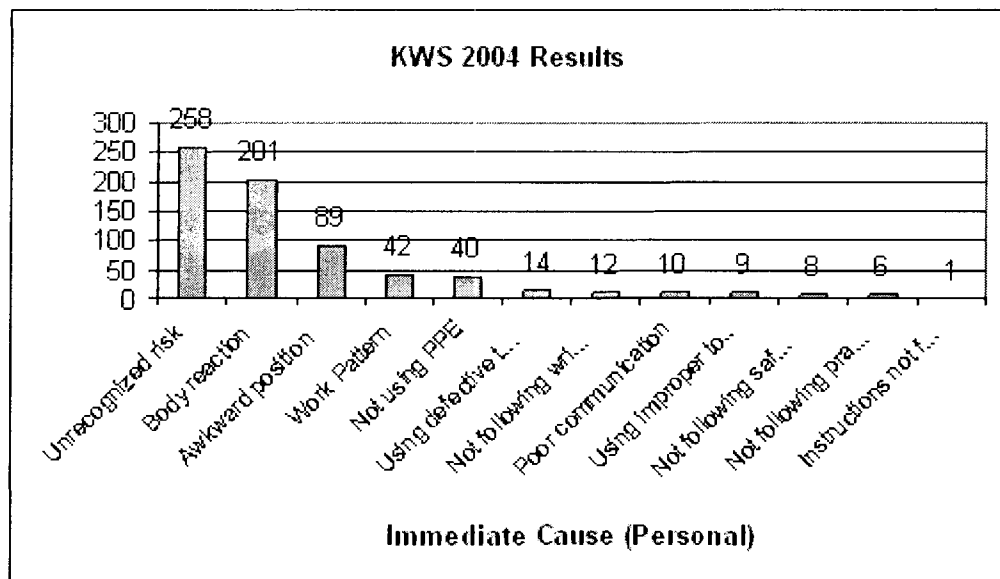
Mobile equipment was ranked as the fifth source of contact in 2004 at KWS, yet for Alcan Inc. mobile equipment was the number one cause of fatalities. Because of this KWS is working extra hard to eliminate any possible interaction between pedestrians and mobile equipment. This will be discussed in more detail under best practice initiatives.

The causes of injuries at KWS paints a clear picture of where effort needs to be focused and points to problems with the safety culture of Kitimat. The majority of accidents are related to personal causes. This does not necessarily mean the employee made a mistake or was negligent, but that for some reason the risk was not recognized or the employees was not aware of the risk.

When analysing the statistics for causes of injuries it is important to remember that for every injury an immediate cause and a basic cause has not necessarily been identified and it is also possible that more than one type of immediate cause or basic cause has been identified.

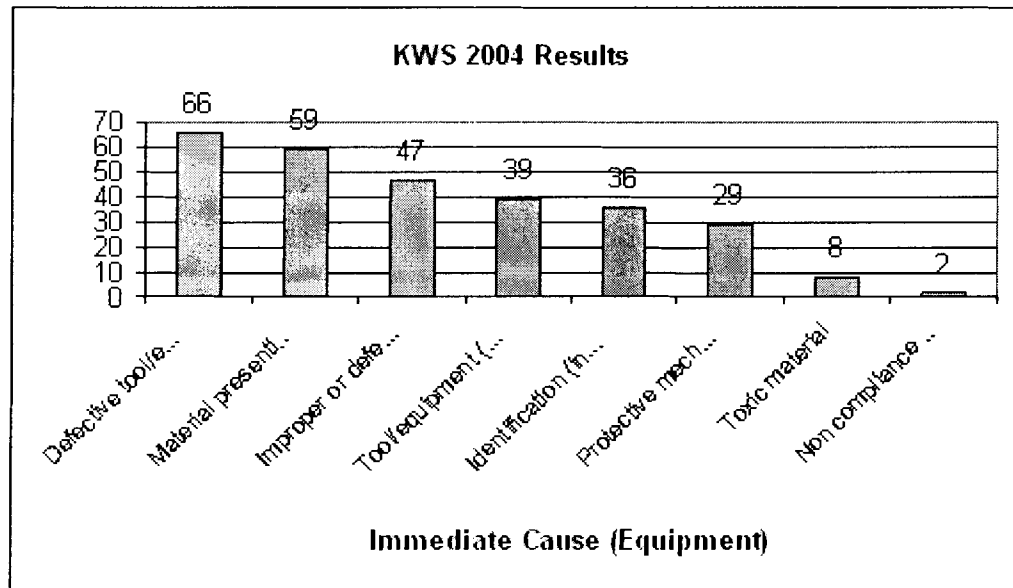
Below are the Paretos for causes for KWS in 2004 in Figures 5.1.6 to 5.1.9.

**Figure 5.1.6: KWS 2004 Immediate Causes (Personal) Pareto**



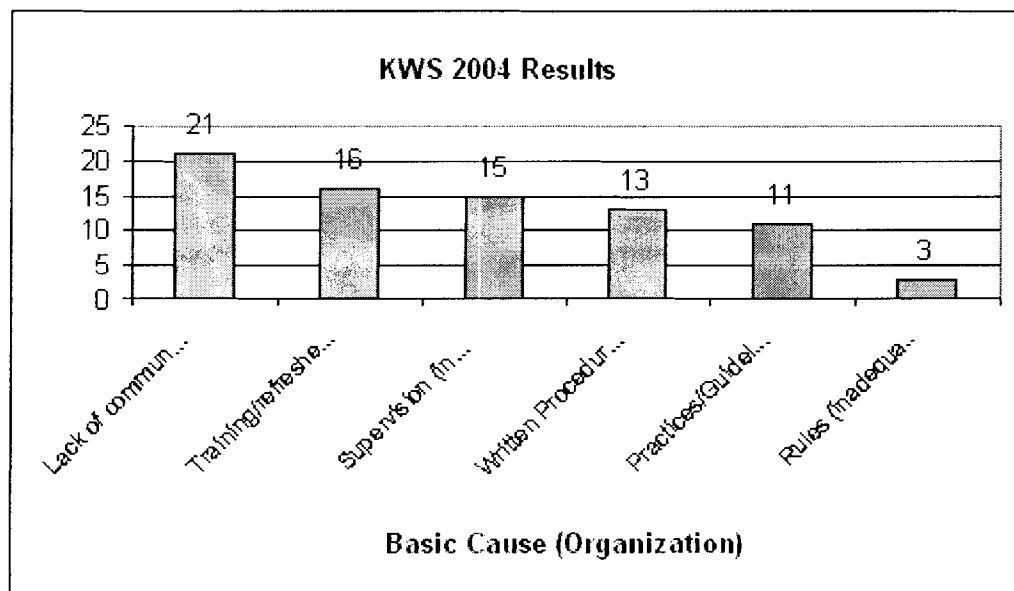
Source: KWS KKOH&S Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.

Figure 5.1.7: KWS 2004 Immediate Causes (Equipment) Pareto



Source: KWS KKOHS Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.

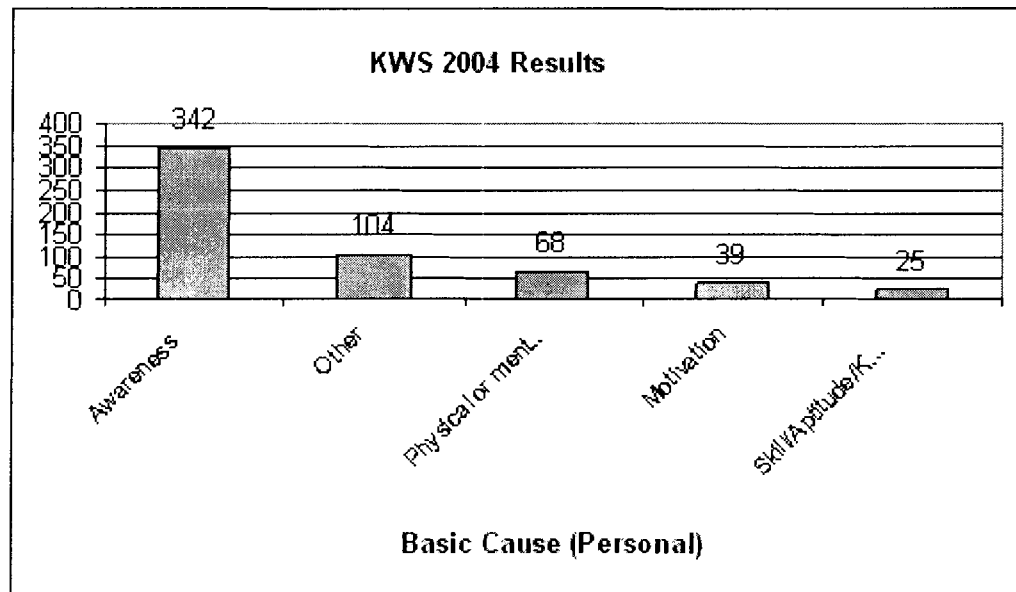
Figure 5.1.8: KWS 2004 Basic Causes (Organization) Pareto



Source: KWS KKOHS Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.



**Figure 5.1.9: KWS 2004 Basic Causes (Personal) Pareto**



Source: KWS KKOH&S Committee Meeting Safety Report Dec 2004. Used with permission of the KWS safety department.

In 2004 a personal immediate cause was identified for 71% of all injuries and 35% had an identified personal basic cause. The most common personal immediate and basic causes are linked together. Unrecognized risk accounted for 36% of all immediate causes or 26% of all injuries, and awareness accounted for 59% of all basic causes or 35% of all injuries. Injuries related to these two types of causes are completely avoidable, and the impact on KWS's safety performance would be enormous if these injuries were eliminated.

With unrecognized risk and awareness being the most common personal cause it is surprising that only 8% of all injuries have an identified basic organizational cause. Of those organizational causes identified lack of communication is ranked the highest at 27%, lack or training or refresher training at 20% and failure of supervision at 19%. Lack of communication and lack of safety training were weaknesses identified with the Alcan Employee Global survey discussed earlier. The statistics back up employee perceptions that these are problem areas. The same three organizational causes will be responsible for the most common personal causes and

need given extra attention. The fact that only 8% of accidents had a basic organizational cause recognized should not be a reason to negate this issue and this statistic should be challenged. If accurate and high-quality communication is occurring, with adequate employee training and supervision, why are some many employees being injured because they were not aware that their actions were risky? Safety culture again appears to be a major factor in KWS's safety results.

Injuries with an immediate cause linked to equipment can be completely preventable. 29% of all injuries were related to equipment, with defective tools / equipment being the most common. One would expect these injuries to be linked to training and awareness as to how equipment is expected to look and function.

Injuries at KWS can also be broken down in the four major areas, power, smelter, casting and maintenance. The safety results by area are included in Table 5.1.2 and show that the area with the highest number of recordable injuries is Casting, with the Smelter having the highest amount of lost time injuries. Each area has its own safety coordinator and is concentrating on improving safety performance in its own area.

**Table 5.1.2: 2004 KWS Safety Results (per 200,000 hrs worked)**

	Power	Smelter	Casting	Maintenance	Kitimat Avg
Year	2004	2004	2004	2004	2004
Lost Time	1.3	2.7	1.8	1.1	1.8
Severity/Lost Days	41.0	92.0	64.0	4.0	54.0
First Aid / Recordables	2.8	6.9	8.8	3.2	5.2
Restricted Work	5.0	319.6	113.0	16.5	454.0
Medical Treatments	0.0	12.0	8.0	7.0	29.0

## 5.2 Best Practices

In an effort to improve safety results within Alcan as a whole a database of best practices is being established. Business units that have achieved major successes are able to share their

results with the rest of the group and provide detailed information on the procedure used, what they believe the success factors were, traps to avoid, and who the key players need to be.

KWS has currently selected five best practices and is considering implementing them. The best practices include Behaviour-Based Safety, Leadership in Action, Major Hazards, Vehicle Pedestrian Separation, and Change Management. From examination of the types of safety issues occurring at KWS these five best practices appear to be well chosen.

### **5.2.1 Behaviour-Based Safety**

Behaviour Based Safety is a topic occurring in many safety programs, this is the result of the need to change the way employees think of safety and ultimately change the safety culture. The employee attitude is critical to safety results. The objective of behaviour based safety is to develop good work habits and reduce incidents and injuries that are purely caused by people's behaviour. The focus is on behaviours which are observable and measurable. Best results come from not trying to change the culture quickly but by focusing on work teams and trying to change only a few behaviours at one time<sup>xxv</sup>.

The type of behaviour focused on will often be based around the elimination of a common short cut. Short cut elimination is seen as a key driver to improving safety results. The habit of taking short cuts can be difficult to change if employees don't see the value in spending the extra time and energy to complete a task using required safety procedures. Measurement systems outside of the safety program must not contradict the efforts in this area. Communication between employees and also the different levels of management must be a two way process to make certain that the efforts to change the culture are not undermined by outside factors.

An article in the March 2004 Behaviour Based Safety Report provided a nine step process to changing an organization's safety culture. The nine steps are summarized below in

Table 5.2.1. The message is re-enforced once again of the need for commitment from all levels of management and for training and good communication. Safety must start at the corporate level and filter down to the front lines. Communication is not only talking and interacting but a willingness to share meaningful data daily.

Recognizing safety achievements is also an important part of changing culture.

Everyone needs to feel that their effort was appreciated in order to ensure the level of effort does not decline and the culture only experiences a temporary change in results.

**Table 5.2.1: Nine Steps for Changing Your Safety Culture**

1. Walk the talk 100 percent of the time
2. Meet the minimal safety standards
3. Find supporters and enlist their help
4. Promote the corporate policy on safety
5. Train your supervisors
6. Provide meaningful data to managers
7. Hold managers and supervisors accountable
8. Recognize safety achievements
9. Gain access to top management

Source: Behaviour Based Safety Report, March 2004<sup>xxvi</sup>

The Alcan Behaviour based safety best practice is nearly identical, it has an objective of targeting and developing good work habits within natural work teams and to reduce the number of incidents and injuries caused by people's behaviour. There is a definite need for this at KWS to reduce the number of injuries caused by personal factors. Despite unrecognized risk being the most commonly identified cause of accidents, many employees will challenge that it is more an issue of taking short-cuts and not stopping to consider the risk than a true unrecognized risk.

The Alcan Behaviour-Based Safety best practice originated and had been validated in the Grande-Baie plant. This best practice is given credit for their current safety culture and performance. The frequency of incidents and accidents has declined significantly and it is reported that employees have a much more positive attitude towards human behaviour and deviations since the implementation.

Before implementation can occur in Kitimat the name of this initiative will likely need to be changed, or it will likely fail before it even gets started. There is an “us and them” mentality at KWS the union will likely see the name and assume that management is trying to blame all of the safety issues on “bad” employees that need to improve their behaviour. The poor relationship between management and union will make selling this program difficult even though it will benefit everyone involved. This comes back to the fact that there is a low level of awareness within the plant of the risk being taken daily.

Success factors mandatory for behaviour-based safety include having a strongly committed management and supervisory team, which will use a structured approach to observe and measure behaviours. Good training will be required for all those involved into the principles of human behaviour, and care will need to be given to ensure that the application of the process does not overshadow the need for using these basic principles.

It is will not be possible to duplicate the Grande-Baie processes identically, but the best practice information will provide a starting point for KWS to develop its own method for achieving similar results.

### **5.2.2 Leadership in Action**

Leadership in Action has been credited in the Alcan Arvida plant in Quebec for the reduction of injuries and accidents related to major risk. It is also credited with improving

workplace behaviours and allowing the establishment of effective communication between the various levels of the organization. KWS has currently started implementing this best practice and made it a 2005 EHS objective.

Leadership in action is described as the implementation of leadership practices by management and supervisory staff based on the application of four practices evolving through five levels. The four practices are hierarchal security inspections, rituals and coaching in action, observation and intervention on major risk, and communication. These practices are focused on observation, feedback and communication.

The objectives of leadership in action include management demonstrating leadership in EHS, encouraged bi-directional communication and the development of supervision through coaching. Last but not least there is an objective to control risk present in the environment. Success in achieving these objectives will be very beneficial to KWS as every effort is needed to improve the safety culture and facilitate communication. The Behaviour-based safety initiative will be complementary to Leadership in Action. The key success factors of both best practices are linked and include involvement from all levels of management and focusing on people's behaviours and habits.

### **5.2.3 Major Hazard Program**

The major hazard program is a structured, systematic approach to highlight major hazards on the plant and to either eliminate them or ensure controls are in place to minimize risks. This is a proactive program which will involve the entire line ownership. Each department will review all hazards in their area and generate a list of hazards. From the list three will be selected as a starting point and become the "rolling three." Once one major hazard has been eliminated fully,

including awareness training, and changes to all procedures and documentation a new hazard will be added to the list.

Many opportunities exist within this program if it implemented with the full support of the plant manager and all levels of the organization are allowed to participate to ensure that the “real” concerns of the front line employees are heard. This should be a simple transparent process with visible results. Employees should be able to see continual improvement in the areas that they work in as major hazards are addressed.

Traps to avoid in the process include trying to deal with items that are too large to realistically tackle. Failure to complete a selected rolling three item will destroy the credibility of the program. Top management needs to be involved in the selection of the rolling three for to allow resources to be allocated to best serve the overall needs of the entire organization.

This best practice has potential to have significant impact on KWS safety culture. Within the process formal opportunity is available for two-way communication. As the risk assessments are done and discussions occur awareness of the current risks should increase as risks are reviewed that have just been accepted in the past.

Opportunities can exist for all employees to take ownership in the process and be named as part of the process. Empowerment of frontline workers will assist in the elimination of the “us and them” culture at KWS. Recognition of success will re-enforce the feeling of empowerment.

The largest impact will come when a rolling three item is completed and physical results can be seen. For many employees it will be at this point that they will start to buy into the process. Initially many will feel that this program is just management talking about doing things again, instead of actually doing. Management can prove its commitment to safety in a tangible way with this best practice by completing rolling three items and not letting the program fade with

time. This program should be come an integral part of the continuous improvement program at KWS.

#### **5.2.4 Vehicle Pedestrian Separation**

Vehicle pedestrian separation is the big issue in the industry due to the fact that 35% of all fatalities are directly related to mobile equipment, 50% when cranes and hoist are included in this statistic. KWS has a large mobile equipment fleet and many pedestrians and as a result is well into initiating this best practice.

The vehicle pedestrian separation program has full support of the plant director and is being driven from the top down. Resources are being allocated and visible improvements are occurring. Opportunities are being given to all employees to make suggests for improvements. This initiative is similar to the rolling three concept except that it is focused on only one type of risk and is being initiated quickly plant wide with no limitation to the number of items being worked on at one time.

Not all changes resulting from the vehicle pedestrian separation program are physical. In some cases barriers are being installed or doorways are be moved, but many initiatives are purely procedural changes and involve modifying times that certain tasks are being done or travel routes taken by equipments. This is where the culture becomes a factor as employees need to understand why they can't just walk thought a vehicle entrance, but have to walk a few more steps and stay on the pedestrian pathway and use the pedestrian doorway. The natural tendency to take shortcuts is going to be the most challenging part of this initiative. By working to raise risk awareness and dealing with the safety culture simultaneously along side with the vehicle pedestrian separation initiative positive results should be seen in safety performance.



### **5.2.5 Change Management**

The Alcan best practice for change management places importance on ensuring that hygiene, safety and environmental requirements are considered as part of every project. The correct people need to review changes being made in the plant with the emphasis being on changes related to buildings, structures, equipment, work stations as well as operations and processes.

A committee is to be created which will follow projects from the initial design stage to the final implementation of the project. Currently at KWS individuals from all three areas are required to review all projects as part of the validation process. Involvement from hygiene, safety and environmental basically stops at that point unless a specific issue arises, or the project is being sponsored by one of the three departments. Once the project is complete the three departments will be involved in validating the final report, however this is not the time when you want safety issues to be discovered as they may be costly to repair and the equipment may already be in operation. More proactive involvement from the three areas has resulted in increased awareness and improved vision of the impact of hygiene, safety and environment in change management.

## **5.3 KWS Employee Perception of Safety**

The Alcan Global Employee Survey previously referred to along with the DuPont Safety Survey of Safe and Unsafe US companies included in JM Stewart's book, *Managing for World Class Safety*, provides some insight into the employee perceptions of safety at KWS. Listening to the opinions of the employees is an important step in improving communications. It is by taking their opinions and comparing them with the opinions of employees at other companies that some insight can be given to the factors that are affecting the KWS corporate and safety cultures.

Within the Alcan survey five questions pertained to safety, which can be compared to five questions out the DuPont Survey. The KWS results have been compared to DuPont's to see how KWS rates compared to the safest and most unsafe companies in the US. The five questions are actually statements and employees were asked if they agreed, didn't know, or disagreed. The results for the number of employees agreeing along with the results from the comparable DuPont question are included in the table 5.3.1 and as a graph in Figure 5.3.1 below.

**Table 5.3.1: Alcan Global Employee Survey Safety Question Results**

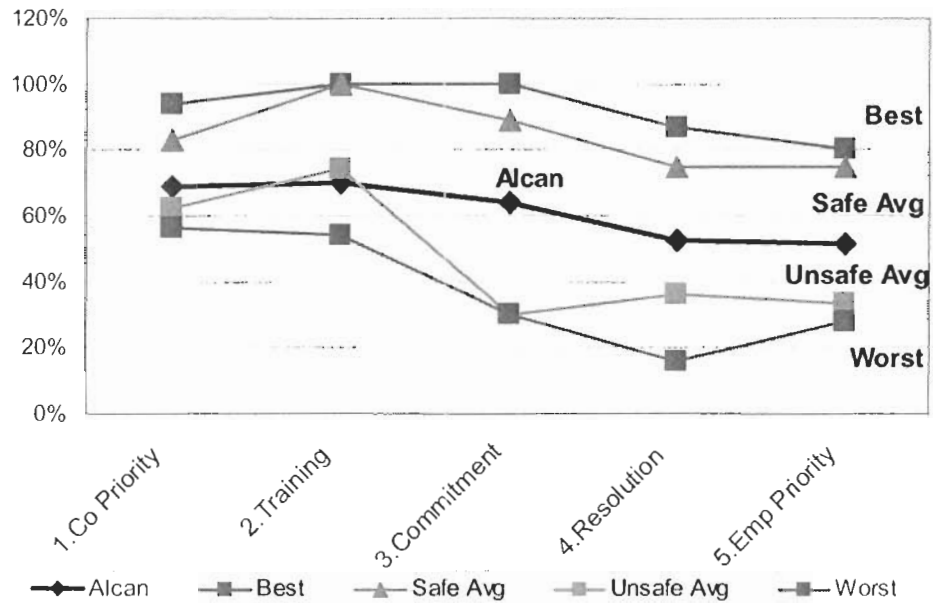
Question	Alcan				Dupont			
	2002	2003	2004	3yr Avg	Best	Safe Avg	Unsafe Avg	Worst
1. At Alcan Health and Safety is a priority	70	67	69	69	94	83	62	56
2. Where I work I am provided with enough training, support and other resources to help prevent injury and illness	72	66	71	70	100	100	74	54
3. Where I work everyone is committed to working safely	66	61	65	64	100	89	30	30
4. Where I work we act quickly to resolve health & safety issues	56	49	52	52	87	75	36	16
5. Where I work, employees health and safety is #1 priority with all employees	51	51	52	51	80	75	33	28

Data compiled from Alcan 2002-2004 Global Employee Survey Results and DuPont Survey published in JM Stewarts Book, Managing for World Class Safety, 2002

When KWS is compared to the DuPont Study results, KWS scores below the average safe company result for every statement. In the area of training KWS scores below the average unsafe company. The comparison between KWS and DuPont shows that even in the areas where KWS received its highest ratings improvement is still needed in order to achieve average safe company performance and major improvements will be required to reach world class standards.

The five statements concentrate on five areas of safety. In order of the biggest gaps to safe average, the areas have been categorized as safety training (Question 2 in Table 5.3.1); company priority of safety (Question 1), resolution of safety issues (Question 4), employee priority of safety (Question 5), and employee safety commitment (Question 3).

Figure 5.3.1: Alcan Global Employee Survey Safety Question Results



Source: Data compiled from Alcan 2002-2004 Global Employee Survey Results and DuPont Survey published in JM Stewarts Book “Managing for World Class Safety”, 2002

The fact that safety training (Question 2) was the area which ranked below the average for an unsafe company was a surprising result. KWS not only has a safety department, it has a training department, and resources are allocated to both for safety training. Safety training is occurring constantly and a formal system exists to ensure all employees receive training before any new job and also receive regular refresher training.

The Alcan survey contained a general question in regards to overall training. “Where I work I receive the necessary training to help me do my work effectively.” The statement received 55% agreement in 2002, 56% agreement in 2003, and 53% in 2004. Employee satisfaction with overall training was on average fifteen percent less than safety training alone. The conclusion could be drawn that safety training is better than the average training offered at KWS. From this small amount of data it is impossible to know if this is the result of unrealistic expectations from employees, or if employee perception and awareness of the current safety

training programs is low, or if real problems exist within the safety training programs. All three possibilities should be examined, but regardless of the cause, this is an area that needs to be addressed.

Question 1, “At Alcan Health and Safety is a priority” received a higher agreement response than the majority of statements within the survey, and when looking at the Alcan survey in isolation this area looks like one of the least of KWS’s problems. Yet when comparing to the DuPont survey KWS is closer to the unsafe average than the safe average. Company safety priority (Question 1 in table 5.3.1) is seen to twenty percent higher than employee safety priority (Question 5). However; you can not draw the conclusion that employees feel that the company makes safety a higher priority than their fellow workers because of slightly different wording between the two questions. Question 1 asks if safety is a priority to Alcan, Question 5 asks if safety is the #1 priority with employees.

One possible explanation for the low agreement to employee safety priority can be found in the from the trust statements segment of the Alcan survey. Only 37% of employees for each of the last three years believe that their fellow employees contribute to an atmosphere of trust and transparency within the workplace. Simply put employees don’t trust each other. Interestingly more employees believe that “everyone they work with is committed to working safety” (Question 3) than believe employees make health and safety a number one priority. The question is then what do employees see that being more important than safety and why are their priorities in the order they are in? The corporate and safety culture both will require changes in order to alter these perceptions.

The sense that resolution of health and safety issues occurs quickly (Question 4) has already been discussed in section 3.3.4.1. The current process is very detailed and perhaps the multiple steps result in the perception that resolution takes to long.

The result of this analysis leads to the conclusion that KWS has many different areas within the safety program and safety culture which require attention in order to see an improvement in actual safety performance results.

#### **5.4 Safety Strategy SWOT Analysis**

KWS has significant challenges ahead to improve safety performance and needs to search out every opportunity possible for improvement. Despite the poor safety results at KWS many positive things are occurring and strengths and opportunities do exist for facilitating improvement and minimizing weaknesses and threats. Table 5.4.1 summarizes a KWS SWOT Strategy Analysis.

Table 5.4.1: Safety Strategy SWOT Analysis

	<p><b>Strengths</b>          Corporate Support          Local Leadership Commitment          Resources available          Safety Program in place          On site safety dept / specialists          Data collection systems in place          Management/Union Joint Safety Committees</p>	<p><b>Weaknesses</b>          High risk tolerance          Short-Cut Culture          Lack of trust          lack of risk awareness          Employee perceptions          Lack of buy in to safety priority</p>
<p><b>Opportunities</b>          New management          Recent Successes          Contract Year</p>	<p><b>SO Strategies</b>          Link new management to recent successes          Leverage new management and support          Emphasis on recent successes</p>	<p><b>WO Strategies</b>          Establish new relationships / new players          Keep leadership visible and available          Provide opportunities for two way communication          Contract change to allow reward system for hourly          Celebrate and announce small successes while waiting for a big one</p>
<p><b>Threats</b>          Past Experience (Failures)          Resistance to Change          Union contract / inability to hold hourly accountable</p>	<p><b>ST Strategies</b>          Use data to ensure failures are not repeated          Use resources to correct past failures          Joint Committee focus on dealing with Critical few</p>	<p><b>WT Strategies</b>          Focus on change management related to work culture          Focus on change management related to safety culture          Invest in human capital</p>

Several strategic alternatives have been generated within the table in order to promote discussion and provide a starting point for considering ways to use the current strengths and opportunities to offset the current weaknesses and threats. Only some will be discussed in detail later on.

#### **5.4.1 Strengths**

The biggest strengths that KWS possesses and can use to facilitate improved safety performance and ultimately achieve a competitive advantage from safety, include strong corporate support and commitment from KWS's new top management. The change in management provides an opportunity to say the past is the past and now we are moving forward. Resources are currently being allocated and safety is the first item on nearly every agenda for any type of meeting. That fact that these types of actions are occurring needs to be communicated loudly and every small accomplishment recognized to ensure that all employees are aware of the work being done, even if it is not currently being reflected in the safety results.

For example, the pedestrian vehicle safety initiatives are currently under way, continual reporting of progress to all employees will allow for all to see that resources are being used and tangible improvements are being made. Dedication to the belief that improved safety results will eventually materialize as a result of the effort being exerted is essential.

The implementation of the Leadership in Action best practice will provide managers and supervisors with opportunities to communicate these results and encourage continued hard work. Changing employee perception of management's attitudes will not occur quickly but if a consistent message is continually preached gradually employees will believe it to be true and allow the message to become part of the safety culture.

#### **5.4.2 Weaknesses**

Many of the weaknesses at KWS are characteristics of the culture at KWS and have been around for many years. Cultural factors impact employee attitudes and beliefs that are cemented by a resistance to change. Short-cuts are taken and there is a high tolerance for risk. Looking back at the rugged origin of KWS you can imagine the type of people who came for the construction and initial start up. They were not afraid to take risks, the challenge was huge and the work was dangerous. These same people raised the children that are many of today's employees.

Lack of awareness of risks is the major cause of accidents; this weakness can be addressed by providing more training in the area of looking for and recognizing risk. Risk can be reduced by improving communication so that when a risk is identified everyone who could be possible be affected is made aware of the risk.

#### **5.4.3 Opportunities**

Opportunities stem mainly from the recent events at KWS. New leadership and recent improvements within the working environment create leverage for continued improvement. The fact that this is a contract year also provides a doorway for considering reward systems for hourly employees. A reward system lined up with safety as the number one priority would speak strongly to the commitment of management to safety.

#### **5.4.4 Threats**

Failures in the past and the resistance to change will be the biggest threat to improving the safety results and culture. KWS is good at collecting data and this data can be used to ensure



failures of the past are not repeated. Managing change using a method that will deal directly with the strong resistance to change will be required.

A detailed but flexible plan coupled with a strong commitment to execute the plan over the long term will be crucial. Recognition that the current culture has taken years to create and will not change overnight is also required. The change management plan will need to address the need for a change in behaviour and mindset of all employees. A change management process model is in the next section.

## **5.5 Safety Culture Change Management**

The need for change is a recognized fact at KWS; it is also a recognized fact that the current culture does not lead itself to be willing to change. The need for a “step change” in safety has been spoken of at KWS for a minimum of three years. A step change can also be referred to a transitional change. The goal is to fix a problem and rather than simply improve *what is*, transitional change replaces *what is* with something entirely different.<sup>xxvii</sup>

Historically KWS has tried to address its safety performance results by demanding a transitional change. The failure to reach the desired new state and make this step change can be linked to the fact that a transitional change works best when there are few people issues; the impact on mindset is minimal. The change required at KWS has significant human variables and the focus is on deep personal change in cultural beliefs and attitudes. The type of change required is a transformational change. A transformational change is a radical shift from one state of being to another, so significant that it requires a shift of culture, behaviour, and mindset to implement successfully and sustain over time<sup>xxviii</sup>.

The transformational process starts when organizational leaders hear the wake-up call and act on it by initiating a transformation process which addresses all the drivers of change.

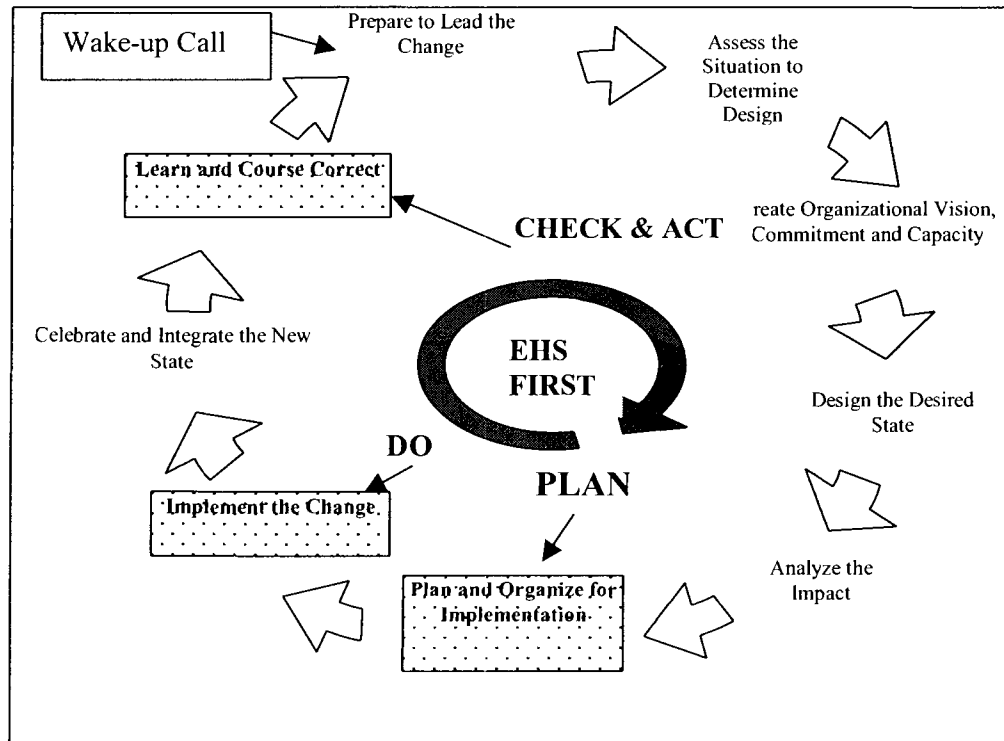
This wake-up call has been heard at KWS and a vision exists. The current focus is on finding the path to turn the vision into reality. The actual future state is not clearly known, other than KWS will have improved safety performance. What is known is that the organizational culture and people's behaviour and mindsets must change, and the human dynamic will make managing the process a difficult one. The best KWS leadership can do is work to facilitate and influence the change.

The Alcan EHS First Management System provides a starting framework for managing the change process. The system is based on a cyclical process of Plan, Do, Check and Act. The EHS First process model fits within the change process model recommended for transformational change in Dean Anderson and Linda Ackerman Anderson's book "Beyond Change Management". A summary of their process model is included in figure 5.5.1 along with the EHS First system in the middle. Links between the two systems are highlighted.

The Transformational change model breaks the EHS first planning step down into six separate steps. These steps must occur at the highest level of the organization as it will only be by their influence that the transformation change process will begin. The doing or implementing of the change is taking all the planning and putting it into action.

The next step in the transformational change process model is to celebrate and integrate the new state. This step does not need to wait until the final vision is fully achieved but should be occurring on an ongoing basis. Recognition is an important part of the process and on that KWS has been guilty of forgetting in the past. Going back to the Alcan Employee Global Survey the statement "Alcan does a good job of recognizing accomplishments and contributions of employees and teams" received only 29% agreement in 2004, and 35% agreement in 2004 to the statement "The recognition I receive motivates me to do an exceptional job". Celebrating success more frequently will help create awareness of improvements as they occur.

**Figure 5.5.1: Transformational Change Process Model**



Alcan EHS First Management System Manual, and Beyond Change Management: Advanced Strategies for Today's Transformational Leaders<sup>xix</sup>

The last step Learn and Course Correct or Check and Act emphasizes the need for continual monitoring and follow-up. It also recognizes the fact that the course will likely change as all of the human factors and outside impacts will be impossible to fully predict in the planning stages.

KWS management can work to achieve the desired transformational change in KWS's safety culture by using the above model to ensure the vision is clear and to provide structure to the process, particularly the planning process. Resources are already being allocated to the process and no additional costs should be seen by implement this model into the current process or by using it as a measuring tool of the work currently being performed.

## 6 RECOMMENDED ACTIONS

At KWS there is a recognized need for improved safety performance and there is a strong desire starting at the top of the organization to see this need met, before KWS experiences a fatality. The overall goal of zero-lost time accidents is a big one but not an impossible one.

This paper has provided evidence showing the need for change to the safety culture. It will be through safety culture changes that safety performance will ultimately improve. Several recommended actions and ideas have been discussed though out this paper and are now summarized below and included in table 5.5.1.

The recommendations are organized into four general categories as many are linked. Included within the recommendations is a starting point for developing a detailed plan. The development of the detailed plan should be assigned to the Continuous Improvement group and become a Black Belt project. Recommendations include the person that should be responsible, a cost if applicable, a suggested time frame and measures to use for follow-up.

The follow-up of the cultural changes required will be challenging to measure due to their intangible nature. The annual Global Employee Survey will be the best source of information for measuring whether employee perceptions have changed. Targets for improvement for 2006 – 2008 survey's are include in the recommended actions table 5.5.1 below. For most targets a five percent per year improvement has been set. Five percent has been chosen as after reviewing previous survey results and observing that typically only small changes are seen each year. With effort applied to the individual areas, an improvement of five percent should be very attainable. It is possible that after the detailed plan is prepared that the targets can be increased. No targets

have been set for actual safety results but the expectation is that as safety culture perceptions change, safety performance results will improve. Targets are set for moving KWS to the safe average results presented earlier. Although targets have been set until 2008, due to the level of improvement required in some areas the target for 2008 is still below the DuPont safe average and a longer timeframe will possibly be required. It will be through continual efforts to implement these recommendations along with generating and implementing additional options that KWS will ultimately achieve the changes required to its safety culture and see the improvement desired in safety performance.

### **1. Make Safety a Company and Employee Priority**

Safety needs to be the number one priority of the company in order to achieve superior safety results, and employees need to believe that safety is the company's number one priority. In order for this to occur the company must continue using every opportunity to communicate its message that safety is number one. It will be through improved two-way communication and the development of trust, employees will begin to believe the safety message being presented by management.

Employees need to believe that their fellow employees make safety their number one priority at work. Addressing this weakness requires improvements in the area of communication and trust between all employees, at all hierarchical levels.

**All reporting systems should be reviewed** to ensure reports being circulated plant wide reflect the message safety is the number on priority. This review can be done by the services area's doing the reporting and should not be a time consuming or costly process. Each area can review the reports they distributed regularly and look for conflicting messages. If conflict is occurring, area management needs to ask why the conflict is present and if it is

Table 5.5.1: Recommended Actions

Objective	Action	Responsible	Cost	Timeframe	Measure	Survey Target	Comments
1	Make Safety a Company and Employee Priority			2006		> 74%	
				2007		> 79%	
				2008	At Alcan Health and safety is a priority.	> 83%	reach safe average by 2008
				2006		> 56%	
				2007	Where I work health and safety is the #1 priority will all employees	> 61%	2008 target still below safe avg
				2008		> 68%	
				2006		> 56%	
				2007	Where I work everyone is committed to work safety	> 61%	2008 target still below safe avg
				2008		> 68%	
					Reporting systems Emphasis on safety	Reporting Department	
	Recognize Safety Culture achievements	Area supervisors		within 2 months of the achievement	Increased number of Ingot articles related to safety culture		
				2006		> 30%	
				2007	Alcan does a good job of recognizing accomplishments and contributions of employees	> 40%	2008 target still below safe avg
				2008		> 50%	
				2006		> 35%	
				2007	The recognition I receive motivates me to do an exceptional job.	> 40%	will still require additional improvement
				2008		> 45%	
	Establish a reward system for hourly	Labour Relations manager / HR manager	\$2 Million plus	2008 contract	ratified by union		
2	Develop Two-way Communication and Trust			2006		> 38%	
				2007		> 43%	
				2008	Effective communication contributes to my commitment	> 48%	
				2006		> 43%	
				2007	I receive useful feedback about how I am doing	> 48%	
				2008		> 53%	
				2006		> 42%	
				2007	Where I work employees contribute to an atmosphere of trust & transparency in the workplace	> 46%	
				2008		> 51%	
				2006		> 44%	
2007	My manager/supervisor creates a work environment of openness and trust	> 49%					
2008		> 54%					
	Major Hazards Best Practice	Champion - Plant Manger Resp - area superintendents		3 months	Each Org develops a strategy and selects a team for the program		
			replacement workers if required	6 months	Each Org team has a list of major hazards identified and first top three chosen		
			Costs become part of the NRE budget.	6 months	Eliminate first hazard		Choose for first hazard a project that can be completed in the timeline to ensure a first win

Table 5.5.1: Recommended Actions (Con't)

Objective	Action	Responsible	Cost	Timeframe	Measure	Survey Target	Comments
2 Develop Two-way Communication and Trust (Con't)	Leadership in Action	Champion - Plant Manager Resp - area superintendents		started	All superintendents going on daily tours >80% of weekdays		Already started
	Speed up communication of identified risks	area safety coordinator and area supervisor		3 months	All identified new risks are reported at the pre-start meeting following the investigation or meeting that identified the risk		Avoid communicating using a bulletin board only
	Establish coaching skills	Area superintendents	to be determined	3 months	Establish a list of all supervisors who have not received coaching training		Include superintendents that have not had coaching training also
	Sharing of Data	Plant Manager		12 months	All supervisors complete coaching training		
	Educate that safety is a competitive advantage	Plant Manager and Controller		started	Continued weekly newsletter. Additional data added to newsletter		
	Empowerment opportunities for hourly	Area superintendents with area supervisors	replacement workers if required	3 months	Add financial data to weekly newsletter. Include measurable safety costs		
	Resolve Health & Safety Issues Quicker	Safety Department Leader		6 months	Establish teams to work on safety activities		Documentation is an immediate need
				6 months	Review safety resolution steps and determine if changes can be made to speed up the process or if better communication of results is required		
				2006	Where I work we act quickly to resolve health and safety issues	> 57%	2008 target still below safe avg
				2007		> 63%	
			2008		> 68%		
3 Develop Risk Awareness				2006	I am provided with enough training and support and other resources to help prevent injury and illness	> 75%	2008 target still below safe avg
				2007		> 80%	
				2008	Determine cause of current dissatisfaction of with training	> 85%	
	Review training programs	Safety Department Leader		6 months	Adjust safety training program to in response to investigation results		
4 Focus on Reduction of Specific Injury Types	Behavior Based Safety Best Practice	Training Department Champion - Plant Manager Resp - Area Superintendents		12 months	Select Behaviors to focus on & add to Leadership tours agenda		
				3 months			
Reduce hand & finger injuries		Joint Health and Safety Committee		3 months	Create empowered work teams in sectors with the highest numbers of injuries to review causes and to determine process or procedural changes required to eliminate risks		
					Reduction of finger injuries, 210 in 2004. Reduction of hand injuries 81 in 2004. Reduction of manual handling injuries, 128 in 2004. Reduction of body movement injuries, 121 in 2004.		

connected to a deeper internal problem that requires further analysis, or if it is simply a matter of changing the report format. For example, include safety data at the beginning of each report, not at the bottom of the last page. Changing report formats can be done immediately by the reporting area without any additional cost.

**Communication of achievements and recognition** in the form of a celebration will prove that management has noticed the efforts of employees who have done a good job at promoting safety behaviours or implemented a change to a process or procedure to make it safer. Positive recognition will encourage employees to continue with the efforts that resulted in the celebration and encourage employees to seek out further opportunities to improve.

Recognition does not need to be monetary, but is an option and is discussed next. Having a work team or employee's performance acknowledged in the company Ingot magazine will provide encouragement and communicate to other employees that their fellow workers are striving to improve safety in the workplace and that safety is their priority. It is important to reward safety culture as opposed to rewarding actual safety.

**A reward system for unionized employees** with safety culture as the key driver will re-enforce the safety priority message. It is important that the criteria be based on culture and not on actual safety results to ensure employees are not tempted to fail to report injuries due to fear of reducing their bonus. Criteria can include results of the observations done as part of the Behaviour Based Safety Best Practice, such as respirator compliance.

This is a contract year but negotiations have already started. It will be too late for this round of negotiations. The Labour Relations superintendent along with a Black Belt should draft a reward system after the 2005 negotiations are complete to ensure a plan will be ready for the next contract negotiation.



Postponement to the next contract year would allow time for determining the cost of implementing such as system. The cost could be substantial if a system was implement that was similar to the current one for staff. Assuming achievement of a 100% bonus at 3% of gross annual base wages the cost would be roughly two million dollars per year or add approximately eight dollars per tonne to the cost of metal.

## **2. Develop Two-way Communication and Trust**

Improved two-way communication between all levels of the hierarchy is required to ensure all employees perceive that management believes safety is the number one priority and so that employees can express their own personal belief that safety is their number one priority.

Implementation of Alcan Best Practices which include opportunities to improve communication need to be a priority, as employees from all levels work with management in teams to make improvements to the work environment. Senior management needs to champion the implementation and the process should not be delayed. Two Best Practices have been chosen to start with, Major Hazard and Leadership in Action.

**The Best Practices of Major Hazards** provides the most opportunity for improved communication and for employee empowerment. Employees are able to express their own concerns as ideas are generated and communicate them with management. Each time a major hazard is removed proof that management has listen and acted will be clear and this is will aid in the development of trust.

Costs associated from the implementation of the Major Hazards Best practices would consist of the resources required to correct the hazards identified. These types of charges would be applied against the non-routine expenditure budget which is a fixed amount and would end up bumping other items not deemed to be as important.

Each area superintendent should be mandated to start the process in their area and develop a team and eliminating a first hazard in six months or less to kick start the process and build trust that the process will work. Care will need to be given to ensure the first project is achievable with the time frame.

**The Best Practice of Leadership in Action** is already started and needs to be continued. Daily tours have been established and should not be allowed to slowly disappear. The regular availability of managers and superintendents along with supervisors provides all employees opportunities to communicate their concerns and ask questions in a comfortable less formal environment. Management has come to them and is showing an interest in what is happening in their area. This is another opportunity to create trust as issues arise and are dealt with.

**Quick communication of identified risks** will ensure an incident is not repeated and stress the priority of keeping all employees aware of the risks that could affect them personally. This should be done by the area safety co-ordinator or supervisor at the first possible opportunity after the risk is identified. All employees participate in pre-start meeting daily so there should never be more than a one day delay in communication.

Avoid communicating only by placing a report on the company bulletin board. Many employees may not see the posting and can be left with the perception that the issue was never addressed.

**Good coaching** will provide a method for establishing trust and communication between management and employees. Supervisors and other staff communicating directly with unionized staff should all receive training on coaching.

The training department at KWS has provided coaching training in the past. Superintendents need to ensure that their supervisors are given the opportunity to receive this

training and that they themselves receive this training if they haven't already. This training will be important to improving communication so it should become a training priority with a goal of having all supervisors trained within the next twelve months. The costs associated with this training would include hiring a temporary replacement for the supervisor, the same as if the supervisor was on holidays, and there would be costs associated to the training department. By ensuring classes are full the cost per supervisor will drop. The training department already has a budget for providing supervisor training so any increase in costs to the training department should be minimal as another type of training will probably be postponed to facilitate the coaching training.

**The regular sharing of data** is critical for transparency in order to improve trust. Employees need to feel involved in the business and being to take ownership of it. Before ownership can occur employees need to understand the business and have enough facts to allow them to understand why management is making the decisions it is making. The recently started weekly news letter is a good example of a method to share data with employees and should continue.

**Communicate the link between safety and sustainability.** As employees take on ownership of the plant they will desire to see it profitable as this is a requirement for long term sustainability. Provide employees with financial information that will allow them to think about the link between safety and the bottom line. For example the cost per tonne of metal could be added to the weekly newspaper. Any improvement to operating costs or increase in production up time will add to profitability. Just considering the cost of a simple accident investigation in terms of measurable costs, without estimating intangibles, will be eye opening for many. The finance department can provide this information easily for the weekly news letter.

**Empowering employees** will provide them opportunities to develop ownership and create opportunities to improve communication. Empowerment is an expression of trust as management allows employees to make decisions regarding a specific issue or project. As Employees participate in an activity and see continual improvement they will realize that change is occurring and that management is truly committed to the process.

Empowerment opportunity within safety activities exist. The need to complete the documentation of all work procedures was identified in the safety investigation results. The employee or group of employees actually performing the work lacking documentation can be empowered to prepare the documentation. The cost associated to this will be replacing the worker(s) temporarily as required.

**Resolve health and safety issues quickly.** A process is currently in place for resolving issues but a perception exists that the process takes to long. The safety department should review the current process to determine if unnecessary steps are being taken or if communication of resolution is slow to filter out after an issue has been resolved.

### **3. Develop Risk Awareness**

Concentrate on the elimination of injuries caused by unrecognized risk and lack of awareness. Improvements to communication will enhance the level of risk awareness as employees discuss safety and the types of work they perform.

**Train employees** to learn to look for and recognize risk. Safety training is the one area that KWS scored worse than the unsafe average in the Dupont study and stands out as the area requiring the most attention and improvement. The fact that training is not viewed as adequate despite all of the programs in place is a major issue that needs to be investigated to determine why.

A full review of programs currently in place is needed. Soliciting information from employees regarding their dissatisfaction with the current programs and their expectations of what they view as adequate training will provide a foundation for revising the safety training programs.

Once safety training programs have been redesigned, measures will be required to determine the success of the new programs and to allow for further opportunities for enhancement to be revealed. The number of employees attending training is not a good measure as all employees should attend the training. The amount of information retained is what needs to be determined. Practical knowledge should be tested to determine the success of the training along with the employee's perception of how useful the training was.

Future accidents which have training identified as a cause need to be taken seriously and be followed up on to avoid the possibility of the accident reoccurring. If an employee received training yet still had an accident, the material and delivery of the training should be reviewed again to determine why it was not effective. Did the employee simply listen to a lecture for an hour and daydream, then left supposedly trained? Perhaps a more interactive training program is required to keep employees engaged. It is important to remember that many positions at KWS are shift work and employees are often fatigued. Just coming off a night shift to receive training during the day does not create an optimal learning environment. The frequency of refresher training should also be reviewed to determine what is the optimal schedule is.

Training currently comes from various sources so it will be necessary for all of the players involved in safety training to meet and examine who is providing what and look for holes in the current system and also look for overlap. This initiative should be lead by the safety leader and training co-ordinator as both departments will need to work together. It is possible that repetition is occurring and that time and resources could be used more effectively.

**The Best Practice of Behaviour Based Safety** should be reviewed and a plan developed to implement it at KWS by senior management. Concentrating in the development of good work habits and the elimination of short cuts will create awareness of the common avoidable risks being taken daily.

Behaviour based safety could be integrated in the Leadership in Action best practices since behaviour based safety is based on observations and managers are already spending time in the plant observing activities. By selecting measurable activities to observing which are related to behaviours identified as requiring a change, particularly common shortcuts, awareness can be created of the risk associated with the particular activity. It is important to concentrate only on a few behaviours at a time as the goal is to develop new work habits which will become a permanent part of the culture.

#### **4. Focus on Reduction of Specific Injury Types and Causes**

**Concentrate on the elimination of finger injuries;** although minor they are the most common type of injury. The same work groups reviewing the other types of specific injuries could also examine the causes of finger injuries. Cost associate with these work groups would be replacing the employees that need to be replaced while meetings are held. This is possibly work that can be done by employees with work restrictions and then the cost would be minimal to none.

**Concentrate on the reduction of manual handling and body movement injuries** by reviewing data to determine if the injury is the result of a poor procedure or a short cut. If a poor procedure is the cause, let an empowered employee work team similar to the group looking at finger and hand injuries, review the procedure and recommend changes. If a short cut is the cause add it to the list of behaviours to be addressed through the Behaviour Based Safety best practice.

## 7 CONCLUSION

Managing the cultural changes required at KWS will be complex as there are significant human variables to consider. Developing a plan that focuses on the deep personal changes required in cultural beliefs and attitudes will not be easy and will require many adjustments along the way. Management has an end goal in place but the path to and appearance of the final resulting culture that will facilitate the end goal is unpredictable. Through managing change slowly using a transformation change process the new culture will begin to evolve and eventually make it self known providing an improved safety environment and a competitive advantage in safety which will facilitate in the achievement of Alcan's governing objective, "Maximizing Value- A Sustainable Business Proposition".

## APPENDIX 1: AREA HAZARD ASSESSMENT WORKSHEET

<b>Area:</b>		<b>Date:</b>		<b>Assessed by:</b>	
<b>I. AREA HAZARD ASSESSMENT</b>					
Hazard	Mark "X" if applicable	Present Protection	U/A	Recommended Protection	
<b>VISIBILITY</b>					
Inadequate area lighting					
Blind corner(s)					
Poor entry into roadway					
Person doors opens into roadway					
Operator – obstructed view					
Pedestrian – obstructed view					
<b>TRAFFIC VOLUME AND FLOW</b>					
No designed walkways					
No designated crosswalks					
Speeds > 6 MPH/10 KPH)					
No signage designating traffic flow					
Crosswalks not at intersection					
Work areas used for mobile equipment traffic					
Mobile equipment traffic enters into pedestrian traffic					
No 5 foot/1.5 m turning radius at vehicle exits					
Mobile equipment operates on either side of pedestrian traffic					
Pedestrian traffic runs into path of crane					



<b>Area:</b>		<b>Date:</b>		<b>Assessed by:</b>	
<b>TRAFFIC CONTROLS</b>					
Inadequate signage in place					
Safe zones not protected					
Other:					
<b>II. TRAFFIC FLOW ASSESSMENT</b>					
	Number normal	Time	Number at peak	Time	Potential Reduction Methods
Production mobile equipment					
Production pedestrians					
Non-production mobile equipment					
Non-production pedestrians					
Interactions					

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