

**BAHRAIN'S COMPETITIVENESS  
IN THE  
ALUMINUM INDUSTRY**

by

Ahmed Saleh Al Noaimi

Submitted to the Sloan School of Management  
in Partial Fulfillment of  
the Requirement of the Degree of  
Master of Science in Management

at the  
Massachusetts Institute of Technology  
May 1994

© Massachusetts Institute of Technology (1994)

**ALL RIGHTS RESERVED**

**Signature redacted**

Signature of Author

MIT Sloan School of Management

April 28, 1994

**Signature redacted**

Certified by

Donald R. Lessard, Professor of International Management

Sloan School of Management

Thesis Supervisor

**Signature redacted**

Certified by

Nazli Choucri, Professor of Political Science

Massachusetts Institute of Technology

Thesis Reader

**Signature redacted**

Accepted by

Susan C. Lowance, Director, Sloan Fellows Program

ARCHIVES

MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY

JUN 30 1994

LIBRARIES

# ANALYSIS OF THE EFFECTS OF

## ADMINISTRATIVE REFORMS

BY

FRANCIS W. WATSON

Professor of Public Administration, University of California, Berkeley

Director of the Center for Public Administration, University of California, Berkeley

San Francisco, California

### Abstract

The administrative reforms of the past few years have been a subject of considerable interest and controversy. The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government. The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government. The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government. The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government.

The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government. The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government.

The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government. The reforms have been a result of a number of factors, including the need for a more efficient and economical government, the desire for a more democratic and participatory government, and the need for a more effective and responsive government.

# **BAHRAIN'S COMPETITIVENESS IN**

## **ALUMINUM INDUSTRY**

**by**

**Ahmed Saleh Al Noaimi**

Submitted to the Alfred P. Sloan School of Management on April 26, 1994

in partial fulfillment of the requirements for the Degree of Master of

Science in Management

### **ABSTRACT**

Taking into consideration its limited resources, and its dependence on oil which formed its only heavy industry, Bahrain decided in the late 1960's to diversify its economy. The country, entered the aluminum industry in 1971 based on plentiful gas reserves and has, so far, enjoyed two profitable decades. Since its first entrance, Bahrain has been expanding its primary aluminum smelter and building new downstream aluminum plants. With its current capacity of 460,000 tonnes per annum, Aluminum Bahrain (ALBA) today is considered as one of the largest smelters in the free world. The aluminum industry is now one of the major sectors of the Bahrain's economy .

The industry, during the last few years, has been facing a severe competition due to the unprecedented oversupply of metal from the Commonwealth of Independent States "CIS".

The thesis examines the changes in the industry's characteristics, and how Bahrain has interacted with these changes in the past. It also reviews the opportunities and threats that faced the country as a result of the latest development in the industry. Using Porter's National Determinants of Competitive Advantage Model, the thesis discusses how Bahrain

can build on its strengths and improve on its weaknesses to sustain its competitive advantages in the industry.

The thesis goes on to propose a coordination strategy among the Gulf Cooperation Council "GCC" countries, who collectively own the various input resources required for the industry. It suggests that these countries should build on their various synergical advantages and divide the process of the industry among the different locations based on the strength of each country. It highlights the strong position of Bahrain as a major producer of primary metal in the world and how the other GCC countries can benefit from this position.

The thesis concludes that Bahrain is very well positioned to sustain its competitive advantage in the global aluminum industry. The coordination among the GCC countries will give the region a leading position in the metal market.

Die Kalkulation der PPT ist ein zentraler Bestandteil der Kostenrechnung und dient dazu, die Kosten für die Produktion eines Produktes zu ermitteln. Sie ist in zwei Hauptbereiche unterteilt: die Vollkostenrechnung und die Teilkostenrechnung.

Die Vollkostenrechnung umfasst alle Kosten, die für die Produktion eines Produktes anfallen. Dies sind die Materialkosten, die Fertigungskosten und die Gemeinkosten. Die Teilkostenrechnung hingegen bezieht sich nur auf die Kosten der Fertigung.

Die Kalkulation der PPT ist ein zentraler Bestandteil der Kostenrechnung und dient dazu, die Kosten für die Produktion eines Produktes zu ermitteln. Sie ist in zwei Hauptbereiche unterteilt: die Vollkostenrechnung und die Teilkostenrechnung.

Die Vollkostenrechnung umfasst alle Kosten, die für die Produktion eines Produktes anfallen. Dies sind die Materialkosten, die Fertigungskosten und die Gemeinkosten. Die Teilkostenrechnung hingegen bezieht sich nur auf die Kosten der Fertigung.

Die Kalkulation der PPT ist ein zentraler Bestandteil der Kostenrechnung und dient dazu, die Kosten für die Produktion eines Produktes zu ermitteln. Sie ist in zwei Hauptbereiche unterteilt: die Vollkostenrechnung und die Teilkostenrechnung.

Die Vollkostenrechnung umfasst alle Kosten, die für die Produktion eines Produktes anfallen. Dies sind die Materialkosten, die Fertigungskosten und die Gemeinkosten. Die Teilkostenrechnung hingegen bezieht sich nur auf die Kosten der Fertigung.

Die Kalkulation der PPT ist ein zentraler Bestandteil der Kostenrechnung und dient dazu, die Kosten für die Produktion eines Produktes zu ermitteln. Sie ist in zwei Hauptbereiche unterteilt: die Vollkostenrechnung und die Teilkostenrechnung.

Die Vollkostenrechnung umfasst alle Kosten, die für die Produktion eines Produktes anfallen. Dies sind die Materialkosten, die Fertigungskosten und die Gemeinkosten. Die Teilkostenrechnung hingegen bezieht sich nur auf die Kosten der Fertigung.

Die Kalkulation der PPT ist ein zentraler Bestandteil der Kostenrechnung und dient dazu, die Kosten für die Produktion eines Produktes zu ermitteln. Sie ist in zwei Hauptbereiche unterteilt: die Vollkostenrechnung und die Teilkostenrechnung.

## ACKNOWLEDGMENT

I owe my thanks to a number of people who have helped me getting this thesis from idea to reality:

- Mr. Gudvin K. Tofte, for his unlimited support throughout my course of study and his valuable comments during all stages of writing this thesis.
- Professor Don R. Lessard, for his advice, guidance, and time he spared in focusing my ideas towards the ultimate objective of the research.
- Professor Nazli Choucri, for her help in reading the thesis and making suggestions for improving this report.
- Mr. Tony Frost, who reviewed the various drafts of this work and provided constructive critiques.
- The general managers of Bahrain Saudi Aluminum Marketing Co. and the aluminum downstream companies in Bahrain who have participated in the questionnaire and who provided very helpful information.
- My secretary Farida A. Kassim, who acted as a link between me and all sources of information in Bahrain and for her follow up and speed delivery of these information.
- Finally, my wife Fatima, and children, Rehab, Raja, Kumail, Aalaa, and Mohamed, who suffered a lot due to change of location, schooling, environment, and culture during the whole year of my study and very busy schedule in Boston.



## TABLE OF CONTENTS

### Introduction

Purpose of the thesis.....	12
Framework for analysis.....	13
Basis of the study.....	14

### Chapter One

<b>Bahrain Background and Economy.....</b>	<b>15</b>
Bahrain Background.....	15
Overall Economic Development .....	17
Petroleum and Gas .....	19
Non-Oil Economy .....	20
Development Planning and Investment .....	25
Gulf Regional Issues .....	27

### Chapter Two

<b>History and Evolution of the Aluminum industry .....</b>	<b>30</b>
Industry Overview .....	30
Industry characteristics.....	31
Industry concentration.....	34
The Structure of the Industry.....	35
Why Aluminum in Bahrain.....	38
How the idea begun.....	38
Competitive disadvantages.....	38
Chance.....	39
Competitive advantages.....	39



Bahrain Aluminum Industry.....	42
Growth and Expansion Chronology.....	43
Product Market.....	45
Downstream Industry.....	47

## Chapter Three

<b>Bahrain's Current Position in the Global Industry.....</b>	<b>49</b>
Industry Condition.....	49
Bahrain Position.....	50
Primary aluminum.....	50
Cost comparison.....	53
Market situation.....	57
Environment.....	64
Worldwide competition.....	65
Gulf Cooperation Council competition.....	67

## Chapter Four

<b>Determinants of Competitive Advantage.....</b>	<b>70</b>
Factor Conditions.....	72
Geographical location.....	72
Bahrain energy reserves.....	73
Human resources.....	75
Knowledge resources.....	78
Demand Conditions.....	84
Relating and Supporting Industries.....	88
Firm Strategy, Structure, and Rivalry.....	89

## Chapter Five

<b>Where To Go From Here ?.....</b>	<b>93</b>
Geographical Location and Market.....	94

Gulf Cooperation Council (GCC), Natural Resources, and Competition.....	96
Local Downstream Companies and Integration.....	100
Research and Development.....	102
Cost Reduction and Increase in Productivity.....	105
Risk Management.....	107
Fluctuation of aluminum prices.....	107
Security of supply.....	108
Conclusion.....	109

<b><i>Bibliography</i></b> .....	111
----------------------------------	-----

<b><i>Appendix</i></b> .....	114
------------------------------	-----



## INTRODUCTION

### **1. Purpose of the thesis**

Faced with depleting energy resources, Bahrain embarked on a series of steps in the late 1960's to diversify its economy. Planning was directed towards promoting export oriented capital and energy-intensive industries and services. By the mid 1980's, Bahrain had achieved rapid progress in diversifying economic activity. Oil refining, aluminum and several ancillary industries were established, offshore banking flourished, and tourism grew rapidly. Unfortunately, this diversification strategy did not last long before it faced severe competition. One of the major local industries affected most by this competition is the aluminum industry.

The massive "flooding" of aluminum by the Commonwealth of Independent States (CIS) during the last few years has fundamentally changed the picture of the industry with the oversupply of metal. This unprecedented change in market characteristics came suddenly at very difficult time for Bahrain. i.e. while the country was half way through expanding its smelter by adding a new reduction line with an annual capacity of 235,000 tonnes of primary aluminum.

The aim of this thesis is to review the development of the aluminum industry in Bahrain, discuss the aluminum market situation, examine the competitive advantage of Bahrain in aluminum smelting, and investigate to what extent has this competitive advantage changed in recent years. The study will also consider whether and how Bahrain's aluminum industry can survive the changing competitive environment and sustain its leadership position in the industry.

## **2. Framework for analysis**

The thesis is divided into five chapters:

- As the production of aluminum is considered a major industry in Bahrain and have some significant impact on its economy, I will allocate the first chapter of this thesis to give the reader some backgrounds on Bahrain and its economy. In this chapter I will go through the government's diversification plan which led to the start up of this industry in Bahrain\* .
- In chapter two, I will review the history and evolution of the aluminum industry and explain the industry concentration. The chapter will then discuss why and how Aluminum Bahrain (ALBA) started. It will also discuss the growth in the primary aluminum production and the establishment of the various aluminum downstream companies in the country since the inception of ALBA until today.
- Chapter three will give brief explanation of the global industry condition, and then will discuss in some detail the Bahrain position in the market. Through this chapter, I will attempt to make some cost comparison between different aluminum producers based on generally available data. Due to the unprecedented flood of metal from the CIS to the international market during the last few years and the significant change it made to the market characteristics, a good part of this chapter will be set apart to analyze the effect of the increasing export of aluminum from the CIS on the market in general and Bahrain in particular.

---

\* Chapter one is substantially based on the International Monetary Fund report dated July 1992 on the recent development of Bahrain. It is jointly written with Abdul Razak A.H. Al Qassim for his thesis in the title The Future of Bahrain as a Financial Center.

- In chapter four, I will use Porter's models to discuss the National Determinants of Competitive Advantage (i.e. the factor conditions, demand conditions, related and supporting industries, and the firm strategy, structure, and rivalry) for the Bahrain aluminum industry.
- Based on the findings from the previous chapters, I will attempt in chapter five to outline some recommendations on where the aluminum industry in Bahrain should go from here.

### **3. Basis of the study**

Frameworks and data used in this study are based on the following four sources:

1. Library research and various literature as referred to in the biography,
2. The contents of the (Master of Science in Management) course,
3. The questionnaire completed by the downstream companies in Bahrain (see appendix), and
4. The experience of the author in the industry.

## Chapter 1

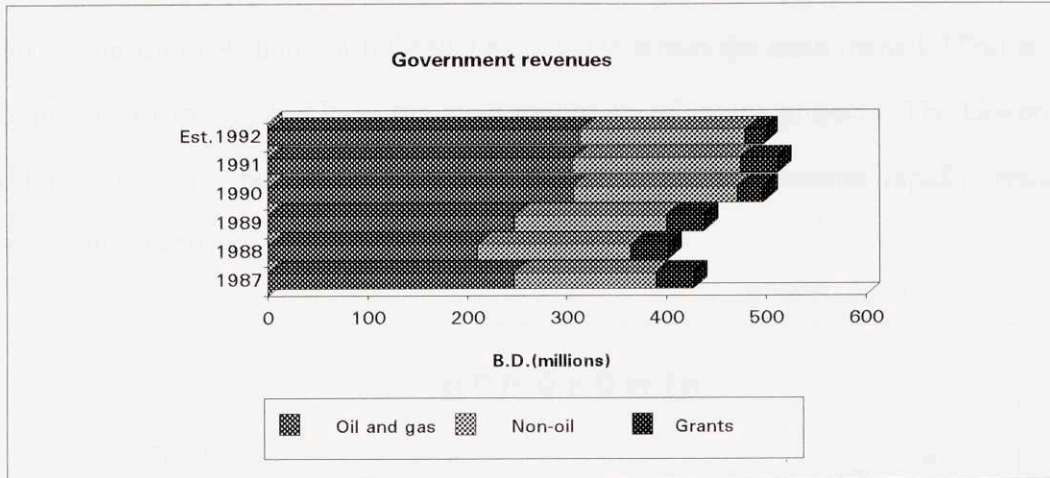
### BAHRAIN BACKGROUND AND ECONOMY

#### **1. Bahrain Background**

Bahrain is an archipelago consisting of 33 islands in the Arabian Gulf, situated between Saudi Arabia's East coast and Qatar peninsula. The islands cover a total area of 693 square kilometers, making it slightly smaller than Singapore.

Bahrain has been an independent sovereign state since 1971 and is ruled by the Amir, H.H. Sheikh Isa Bin Salman Al-Khalifa, who succeeded in 1961. The affairs of state are run by the Prime Minister and a Council of Ministers presently comprising 15 members appointed by the Amir. Bahrain is a member of the Gulf Cooperation Council (GCC), the United Nations, the Arab League, the International Monetary Fund, the World Bank and several other international organizations.

Bahrain is a small open economy with a population of 516,444 as of 1991 and with a total employment of 212,070. Expatriate labor comprises about 60 percent of this labor force. The economy of Bahrain is dominated and almost singly driven by the public sector's revenues from oil and gas. Value added generated in the government-owned oil and gas sector, government services, and joint ventures manufacturing enterprises account for over 60 percent of GDP. The sharp increase in government revenues in the 1970s which was mainly on account of higher oil prices, facilitated rapid progress in establishing an extensive modern infrastructure allowing Bahrain's population to enjoy a relatively high standard of living.

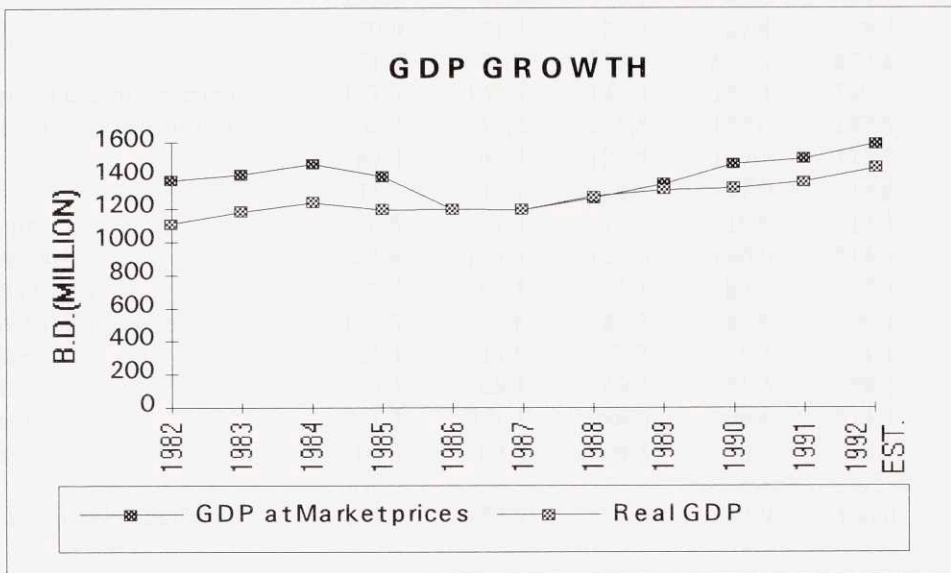


Reserves of onshore oil, estimated at about 150 million barrels, could be exhausted by the end of the century at the present level of production. Recognizing this limited petroleum reserves, the Government, in the early 1970s, initiated economic diversification efforts aimed at utilizing domestic natural gas resources to develop an export-oriented, energy intensive manufacturing sector. At the same time, the diversification plan aimed at developing Bahrain as an offshore financial center. As a result, the country experienced high rates of real economic growth through late 1970's and early 1980's.

Despite rising import levels, the external current account and the overall external position experienced large surpluses, and foreign reserves were accumulated. These trends were maintained through the early 1980s despite the regional Iraq-Iran conflict, due to continued strong world oil prices and an increase in petroleum exports attributable to Bahrain receiving a half share of the offshore Abu Saafa oil field operated by Saudi Arabia.



The Government's current diversification policy has aimed at expanding existing joint venture projects and encouraging private sector investment in downstream industry. The expansion of Aluminum Bahrain (ALBA) (in which the state owned 77%) to twice the previous capacity has been the most important of recent projects. The Government policy to privatize non strategic industries, while not progressing rapidly, remains a long-term objective.



## **2. Overall economic development**

As a result of progress that has been made in the recent past in diversifying Bahrain's economic bases, combined with weakened oil prices, the contribution of the crude oil and gas sector to national income declined to about 17 percent over the past five years from about 20 percent in the mid-1980s. The decline was offset by a rise in the share of industry to 23 percent, while services remained relatively stable at 60 percent (Table 1). However, the role of oil and gas remains predominant as it is the primary source of government revenue to finance government expenditures which, in turn, are the driving force behind non-oil economic activity. Expenditures have been equivalent to about one half of non-oil GDP in recent years.

**Table 1 Bahrain: Gross Domestic Product by Sector Origin, 1986-91**

	1986	1987	1988	1989	1990	1991
	( In millions of Bahrain Dinars at current prices)					
Crude oil and gas	229.0	222.7	193.7	233.8	322.7	295.4
Quarrying	2.7	2.3	2.3	2.6	1.2	1.1
Agriculture and fishing	16.4	16.0	15.3	15.8	14.3	14.0
Industry	289.8	299.7	348.5	355.2	375.5	364.5
Refining and gas liquefaction	77.7	78.5	60.8	76.9	120.1	114.2
Manufacturing	88.4	112.5	174.4	162.9	132.6	135.6
Construction	102.8	86.8	90.1	87.6	94.1	90.5
Electricity and water	20.9	21.9	23.2	27.8	28.7	24.2
Services	854.5	806.8	878.9	873.0	873.8	952.3
Transport and communication	147.9	139.9	147.2	152.5	140.2	168.6
Trade, hotels, and restaurants	108.9	117.8	135.5	137.0	147.9	167.6
Trade	87.5	93.4	105.8	109.2	115.7	129.1
Hotels	14.6	17.1	18.8	17.0	19.8	25.8
Restaurants	6.8	7.3	10.9	10.8	12.4	12.7
Banks and insurance	201.8	145.9	169.0	140.0	114.3	129.8
Domestic banks	72.8	68.5	72.8	87.9	77.1	82.8
Offshore banking units	103.9	62.6	89.2	46.8	36.1	43.3
Insurance	25.1	14.8	7.0	5.3	1.1	3.7
Real estate	73.5	68.1	69.6	73.5	78.2	86.5
Government	261.3	271.3	288.0	299.6	314.3	319.2
Other services	61.1	63.8	69.5	70.4	78.9	80.6
Less: Imputed service charge	194.2	155.7	176.0	132.9	120.0	128.8
Total GDP, of which:	1,198.3	1,191.8	1,262.7	1,347.5	1,467.5	1,498.5
Non-oil GDP 1/	891.6	890.6	1,008.2	1,036.8	1,024.7	1,088.9
	( As percent of GDP)					
Crude oil and gas	16.4	16.5	13.50	15.8	20.3	18.2
Quarrying	0.2	0.2	0.2	0.2	0.1	0.1
Agriculture and fishing	1.2	1.2	1.1	1.1	0.9	0.9
Industry	20.8	22.2	24.2	24.0	23.7	22.4
Refining and gas liquefaction	5.6	5.8	4.2	5.2	7.6	7.0
Manufacturing	6.3	8.3	12.1	11.0	8.4	8.3
Construction	7.4	6.4	6.3	5.9	5.9	5.6
Services	61.4	59.9	61.1	59.0	55.0	58.5
Transport and communication	10.6	10.4	10.2	10.3	8.8	10.4
Trade, hotels, and restaurants	7.8	8.7	9.4	9.3	9.3	10.3
Banks and insurance	14.5	10.8	11.7	9.5	7.2	8.0
Domestic banks	5.2	5.1	5.1	5.9	4.9	5.7
Offshore banking units	7.5	4.6	6.2	3.2	2.3	2.7
Government	18.8	20.1	20.0	20.2	19.8	19.6

Source: Ministry of Finance and National Economy and International Monetary Fund Report of July 1992.

## **2.1 Petroleum and Gas**

Bahrain's hydrocarbon sector includes production of crude from the onshore Jabal al Dukhan field located in the center of Bahrain, and one half of the production of the offshore Abu Saafa field which is shared with, but operated by, Saudi Arabia. It incorporates, as well, production of natural gas from the Khuff zone, an oil refinery, and a number of downstream industries including a petrochemical plant and a gas liquefaction plant. The major part of the gas output has been used as fuel by energy-intensive industries, such as aluminum, and for power generation.

Bahrain's crude oil output has fluctuated over the 1989-91 period within the range of 111,500-117,000 b/d (barrel per day) including the half share in the Abu Saafa field production. Crude oil output of the onshore Jabal al Dukhan field has remained largely unchanged at about 42,000 b/d in the period 1989-91.

### ***2.1.1 Refinery operations***

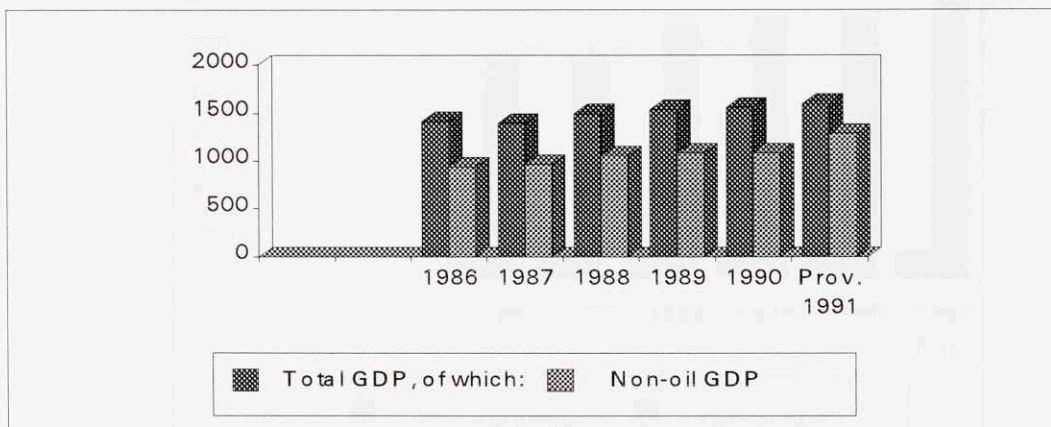
The Bahrain refinery has operated at near full capacity of 250,000 b/d over the past several years. Saudi Arabian light crude, which accounts for 80 percent of crude processed, is transported through a pipeline between the refinery at Sitra and Dhahran in Saudi Arabia. The refinery was established in 1936 with initial refining capacity of 10,000 b/d which has been expanded gradually to the present 250,000 b/d level. The most recent modernization project, to be completed in 1996 at a cost of US\$500 million, is expected to improve the product mix toward a higher concentration of the lighter distillates, and also produce unleaded gasoline enabling the refinery to improve its profitability. Output consists of a wide range of products including gas oil, fuel oil, naphtha, jet fuel, and gasoline which together account for over 90 percent of the total. Exports are mostly marketed in Japan and Europe and include about 96 percent of the refinery products.

### 2.1.2 Gas

Given the unfavorable prospects for new oil discoveries and the low level of proven oil reserves, Bahrain has intensified its dependence on gas as a main source of energy. The gas reserves of 9-12 trillion cubic feet are sufficient for 60 years at current production levels. Requirements of industry and power generation, as well as the growing need to inject gas into aging onshore fields for enhanced oil recovery, have led to a 6 percent rise in natural gas production during 1989-91, while production of natural gas liquids (NGLs) increased by 35 percent. Most of the propane and butane is exported to Japan, naphtha is sent to the refinery, while the residue gas is piped to Aluminum Bahrain (ALBA) for use in combination with non-associated gas from the Khuff zone for power generation.

Expansion of capacity of the LPG plant by 100 million cubic feet per day (mmcf) was completed in 1991 at a cost of US\$87 million. Bahrain's share in financing was US\$65.3 million. The expansion took place in response to increased demand by some downstream industries, such as the urea plant and the polypropylene and methyl tertiary butyl ether (MTBE) plant, both under construction by Gulf Petrochemical Industries Company (GPIC).

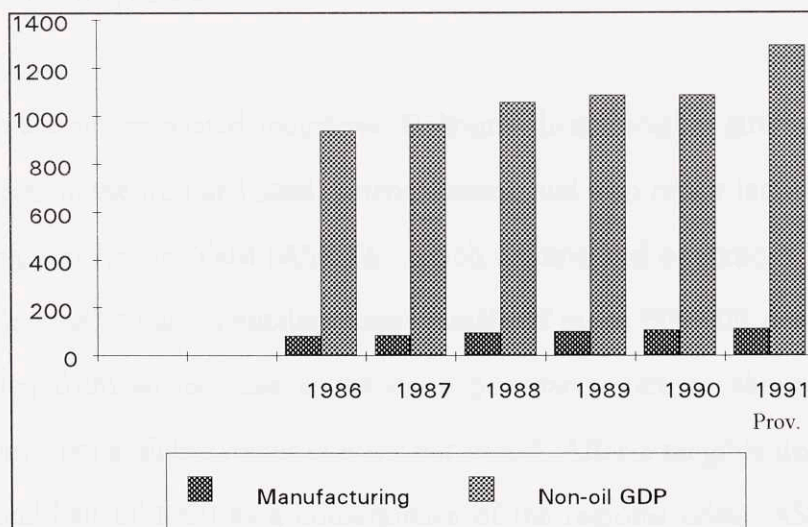
## 2.2 The non-oil economy



### 2.2.1 Non-oil manufacturing Sector

Bahrain's Government has initiated efforts to diversify its industrial base in the 1970s and 1980s by developing export-oriented and energy intensive projects based on cheap domestic energy. The Government launched several projects that included an aluminum smelter and aluminum processing industries, ship repair facilities, a petrochemical plant and factories for iron and steel fabrication. With the completion of these projects, industrial policy has shifted toward the establishment of downstream industries such as aluminum extrusion and rolling. In addition, the Government has launched initiative to provide incentives for small and medium-scale private sector projects. The Government's support for private sector manufacturing has been mostly indirect, through developing an advanced infrastructure, and an exchange and payments system free of restrictions, and a generally liberal expatriate labor policy, and subsidized electricity and water rates.

The role of manufacturing sector in Bahrain's economy increased over the last several years from about 8% of GDP in 1987 to about 9% of GDP over 1989-91 (Table 1). The response of the private sector has been slow as most of the value added generated in this sector originated in activities that are fully or partly owned by the Government.



Bahrain's largest and the most important non-oil industrial project is the ALBA aluminum smelting plant which commenced operations in 1971 as a joint venture between the Government of Bahrain (77 percent); Saudi Arabia Investment Fund, (20 percent); and Breton Investment of the Federal Republic of Germany, (3 percent). After building an initial production capacity of 120,000 tonnes in 1971, ALBA has undertaken several expansion and modernization projects, increasing its capacity to 205,000 tonnes by 1989. The most recent ALBA expansion project was completed in May 1992 bringing Alibi's full capacity to 460,000 tonnes per annum.

The marketing of the Bahraini and Saudi shares in Alibi's production is handled by Bahrain Saudi Aluminum Marketing Company (BALCO), which is owned by the Governments of Bahrain and Saudi Arabia. The company's primary activity is to market the primary aluminum off take from ALBA and 51 percent of the atomized aluminum powder from Bahrain Atomizers International (BAI).

ALBA is also expected to support Bahrain's diversification effort through the potential for downstream industries that it would generate. These will be discussed in detail in chapter three of this thesis.

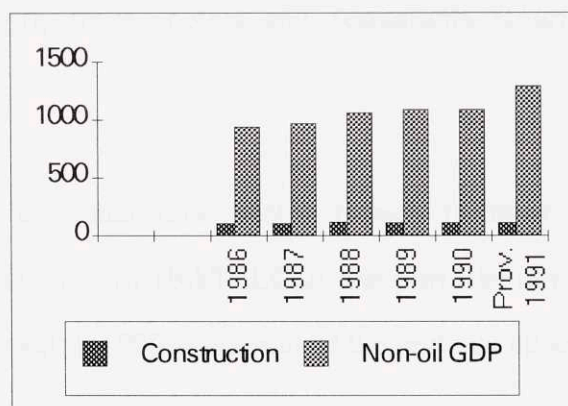
Aside from aluminum-related industries, Bahrain's diversification strategy has included major projects in the iron and steel, petrochemical, and ship repair industries. The Arab Shipbuilding and Repair Yard (ASRY), which commenced operations in 1977 with a dry dock designed to accommodate large vessels of up to 500,000 deadweight (dwt), has benefited from an increase in the dock occupancy rate to about 90 percent in 1989-90 and from a higher repair content per vessel. After a tangible decline in activity in the second half of 1990 as a consequence of the regional crisis, ASRY operations

recovered in 1991. ASRY has recently expanded its activities with the new floating dock which was constructed at an estimated cost of US\$30 million.

The Gulf Petrochemical Industries Company (GPIC), which is owned jointly by the Governments of Bahrain, Kuwait, and Saudi Arabia, commenced production of ammonia and methanol in late 1985. Despite high capacity utilization rates, the fall in world prices for its products has resulted in substantial losses, which were contained below budgeted levels in 1987 through cost reduction measures and a successful rescheduling of bank loans. Following a recovery in prices, the company has reported net profits since the beginning of 1988.

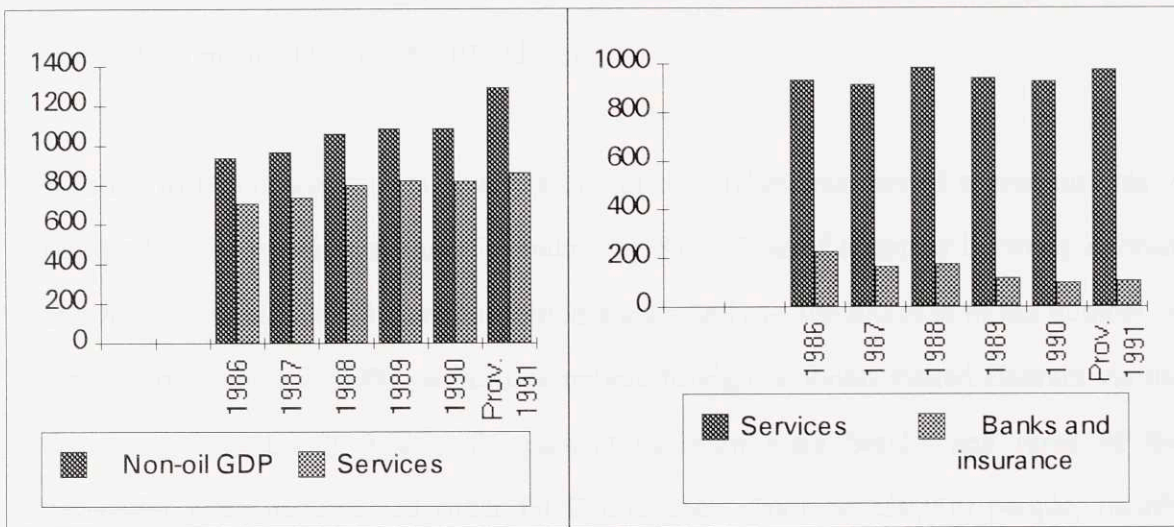
The iron ore palletizing plant of the Arab Iron and Steel Company (AISCO) was started in late 1984 by private shareholders from several Arab countries in the area. It has faced technical and financial problems from the beginning; production was interrupted several times and in 1986 ceased altogether following combined losses of US\$43 million over the 1985-86 period. In early 1988, all of AISCO's assets were transferred to the Gulf Industrial Investment Company, a subsidiary of Kuwait Petroleum Corporation. The reorganized company resumed production in January 1989 under new ownership.

### 2.2.2 Construction Sector



The construction sector declined by 2.5 percent annually during 1989-91. Most of the decline, about 6 percent, was registered in 1989 as the expansionary phase of 1988 could not be sustained. In 1990, construction activity rebounded mostly in the first half of the year in response to an improved overall demand.

### 2.2.3 Services Sector



The services sector has a very important role in Bahrain's economy. The total value added from the services sector represented on average about 60 percent of GDP during 1989-91. Apart from government services, whose contribution has been almost stable at the level of about 22 percent of GDP in the period 1989-91, Bahrain's other main services are transport, trade, hotels and restaurants (tourism), and banking and insurance.

The transport and communication sector (which includes Gulf Air, the Bahrain Telecommunications Company (BATELCO), the port, the airport, and the post office) declined by 14.6 percent in 1990 as a result of the regional crises.



After a modest real growth of 1.6 percent in 1989, trade declined to 0.4 percent in 1990 and rebounded to 11.6 percent in 1991 as a result of the resumption of the overall economic activity.

The banking sector, one of the main service subsections, experienced serious decline in 1989 and 1990 as a result of capital outflows, but rebounded substantially immediately after the cessation of the regional hostilities in 1991; however, value added generated in this sector remained below the 1989 level.

Relative to its population, Bahrain has one of the highest number of tourist arrivals in the world. The opening of the 15.5 mile long King Fahad Causeway between Bahrain and Saudi Arabia in 1986 has contributed significantly to the increase in the number of visitors to Bahrain. In 1989, about one million foreign nationals visited Bahrain via the causeway from Saudi Arabia; 85 percent of them were Saudis and most of the remainder were nationals of other GCC countries. Another 250,000 people, mostly Asians and Europeans, visited Bahrain by air.

### **3. Development, planning and investment**

As a result of the Government effort to diversify the economy, Bahrain by the mid 1980's had achieved rapid progress in industries such as oil refining, aluminum and several ancillary industries including offshore banking and tourism. Planning, however, has not taken a formal integrated approach; it was primarily project oriented.

In 1985 a Strategic Choices Committee (SCC), comprising senior officials of several ministries, was formed to study possible areas of development and the role of the Government in promoting growth. The SCC who reports to the Prime Minister recommended that greater emphasis be placed on development of downstream

activities, selected medium- and small-scale projects producing consumer goods that have an export potential and financed by private capital, both domestic and foreign. The SCC has also recommended that the Government refrain from launching new public sector industrial projects. Growth of the industrial sector would be stimulated through incentives to the domestic and foreign private sectors. The SCC would strive to discourage duplication of industrial plants within GCC.

In the financial sector, the SCC recommended the further formation of specialized banks. The recent establishment of an industrial bank was a first step in providing financial services to promote private industry. Furthermore, tapping the financial assets of existing institutions such as the General Organization for Insurance (GOSI) to help finance industrial development would be encouraged. In other services, the SCC recommended that OBUs diversify their services to help sustain their long-term growth. Other services are also being encouraged through continued development of Bahrain's infrastructure base.

In addition to the provision of a number of incentives in the form of indirect subsidies, such as cheap power, tax exemptions, and subsidized industrial zones, the Government recently introduced several measures to further diversify the economy. New investments in downstream aluminum industry now benefit from grants for the employment of nationals. To benefit from the incentive program, new enterprises had to submit feasibility studies that indicated profitability without the grant.

The investment environment has also been enhanced by rapidly processing licenses for setting up industries. Restrictions in granting licenses would only apply to over-capacity areas and areas deemed strategic. Foreign ownership of up to 100 percent had been allowed since June of 1991. However, to benefit from the trade arrangement within

GCC, in addition to a 40 percent value added generated domestically, at least 51 percent ownership is required by GCC nationals. Certain enterprises (a total of nine companies in 1992) had also been supported by a 20 percent temporary protection tariff. The tariff covers only certain products and would be granted for one year; an extension may be granted in some cases. Downstream industries such as aluminum extraction, chemicals, and pharmaceutical products, have benefited from protective tariffs.

To encourage the further movement of the market toward commercial principles in production and trade, the Government initiated steps aimed at privatizing joint-venture enterprises. So far, Government ownership in BALEXCO had been reduced from 80 percent to 20 percent. The Government intends to continue in the direction of reducing its share in a number of other joint-venture projects.

In addition to projects undertaken by the Government to enhance infrastructure and opportunities for downstream industries, the public sector has undertaken a number of joint-venture projects financed from non government sources which are expected to be completed during 1993-96 at an estimated cost of US\$800 million; the public sector's share is expected to be 50 percent.

#### **4. Gulf regional issues**

Since the establishment of the GCC in 1981, several steps have been taken to integrate the economies of the member countries. Under an agreement reached in 1983, a process of unification of tariff schedules of member countries was initiated. Member countries are allowed to impose tariff duties on goods originating outside the region (and not accorded duty-free access) at rates ranging between 4 percent and 20 percent. However, since 1986, compliance in applying these rates has not been uniform and a

new agreement has been reached to implement a unified common external tariff by March 1993. Goods originating in GCC member countries are exempt from import duties provided that at least 40 percent of the value added is produced in the GCC region and that at least 51 percent of the capital of the producing firm is owned by citizens of the GCC member countries. Reflecting this exemption, the opening in 1986 of the causeway linking Bahrain to Saudi Arabia and the increased economic diversification in the region, the share of GCC rose by some threefold to about 10 percent of Bahrain's non-oil imports over the past decade.

Citizens of GCC countries are allowed to purchase and own shares of industrial companies in all the GCC member countries. In addition, free movement of indigenous workers is provided in the GCC region. Citizens of the GCC member countries can also borrow from the specialized credit institution of any member country providing loans are for industrial development and on common terms relating to maturity and charges. Preferential treatment in government purchases has also been accorded to GCC companies (a 10 percent price differential for a national company and a 5 percent price differential for a GCC company).

The Gulf Investment Corporation (GIC) which is aimed at undertaking joint ventures with the private sector (with the GIC participation ranging from 10 percent to 40 percent) became operational in 1986. Since its inception the GIC has invested in various projects in the GCC countries. In addition, a number of projects that are jointly owned by some or all of the GCC states have been established. In Bahrain, the major projects that are jointly owned by Bahrain and one or more GCC states include Gulf Air, ALBA, and BAPCO.

Over the past two years a number of steps have been taken to enhance cooperation among the GCC states in a number of areas. These include arrangements aimed at allowing GCC corporations to open subsidiaries in all member countries, unifying laws pertaining to property rights, and agreeing to establish a development fund to provide financing for projects in Arab countries, with emphasis on the private sector. The authorities stated that the coordination among the GCC monetary authorities to defend declared parities, which was initiated during the regional crisis, continued to operate effectively.

An economic cooperation agreement between the GCC and the EC, concluded in 1988, commits member countries of each group to grant most-favored-nation status to member countries of the other group. Since then, negotiations aimed at creating a free trade area between the GCC and the EC have been underway.

Year	Country	Value	Value
1988	UAE	1,200	1,200
1989	UAE	1,200	1,200
1990	UAE	1,200	1,200
1991	UAE	1,200	1,200
1992	UAE	1,200	1,200
1993	UAE	1,200	1,200
1994	UAE	1,200	1,200
1995	UAE	1,200	1,200
1996	UAE	1,200	1,200
1997	UAE	1,200	1,200
1998	UAE	1,200	1,200
1999	UAE	1,200	1,200
2000	UAE	1,200	1,200
2001	UAE	1,200	1,200
2002	UAE	1,200	1,200
2003	UAE	1,200	1,200
2004	UAE	1,200	1,200
2005	UAE	1,200	1,200
2006	UAE	1,200	1,200
2007	UAE	1,200	1,200
2008	UAE	1,200	1,200
2009	UAE	1,200	1,200
2010	UAE	1,200	1,200
2011	UAE	1,200	1,200
2012	UAE	1,200	1,200
2013	UAE	1,200	1,200
2014	UAE	1,200	1,200
2015	UAE	1,200	1,200
2016	UAE	1,200	1,200
2017	UAE	1,200	1,200
2018	UAE	1,200	1,200
2019	UAE	1,200	1,200
2020	UAE	1,200	1,200
2021	UAE	1,200	1,200
2022	UAE	1,200	1,200

## Chapter 2

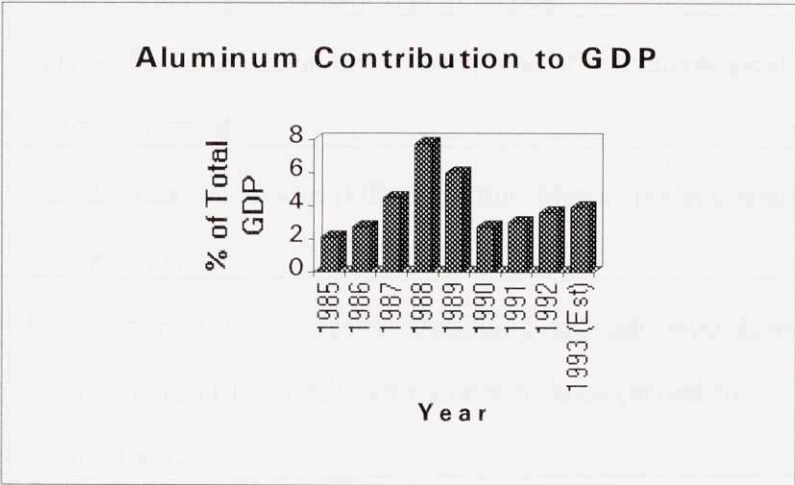
### HISTORY AND EVOLUTION OF THE ALUMINUM INDUSTRY

#### 1) Industry Overview

Bahrain has the first major aluminum industry in the region through the formation of Aluminum Bahrain (ALBA) in 1968. ALBA was formed to construct, own, and operate a 120,000 tonne per annum aluminum smelter. The smelter commenced commercial production in 1971 and its capacity has been successively expanded to its present level of 460,000 tonne per annum. The following table shows the growth of primary aluminum production since ALBA's inception.

<b>Year</b>	<b>Project</b>	<b>Additional Capacity (tonnes)</b>	<b>Cumulative Capacity (tonnes)</b>
1968	Construction of reduction lines one and two started	120,000	120,000
1981	Reduction line No. 3 was built	50,000	170,000
1991	Reduction line No. 3 was expanded	25,000	190,000
1992	Operation commencement of Reduction line No 4	235,000	425,000
1971 to date	Modernization and other improvement programs	35,000	460,000

The percentage share of manufacturing in Bahrain's gross domestic product has been continually increasing. It increased from 10.0% in 1985 to 16.5% in 1991, while the percentage share of crude oil and gas went down from 28.6% in 1985 to 18.6% in 1991. Aluminum earnings percentage to GNP during the same period has increased from 2% to 3% with 1988 at a record of 8% (due to exceptionally high prices). This contribution during the last two years has slightly improved to 3.6% and 4% respectively.



Source: Ministry of Finance and National Economy

**1.1. Industry Characteristics**

The aluminum industry is a typical representative of the primary metals industry as a whole. A study done by Katz (1989) looked at the after tax return on invested capital in US manufacturing industries, from 1960 to 1985, and the primary metals industry offered the lowest return of any industry profiled. This industry when classified on the life cycle model is an industry clearly in its mature phase. As Grant (1991) states "in the maturity phase, product technology diffuses and the emphasis of knowledge development shifts to the quest for cost efficiency through innovation." In addition activities in mature industries tend to get relocated to places where low cost of

production is supported. Grant goes on to list industry characteristics which are representative of an industry in this point of its life cycle. These characteristics are listed below:

**The industry structure and competition at the maturity stage of the life-cycle**

<i>Industry characteristic</i>	<i>At Maturity stage</i>
Demand	Mass market, replacement/ repeat buying.
Technology	Well-diffused technical know-how; quest for technological improvements.
Products	Standardization lessens differentiation. Minor model changes predominate.
Manufacture & Distribution	Emergence of over capacity. Deskilling of production. Long production runs. Reduced number of lines carried by distributors.
Trade	Shift of manufacture from advanced countries to poorer countries
Competition	Shake out. Price competition increases.
Key success factors	Cost - efficiency scale, process innovation, buyer selection.

One of the key points worth focusing on in this list is the key success factors. Any discussion of survival in a mature industry constantly focuses on the continued search for cost efficiency. This one point is the central objective for anyone doing business in the aluminum processing industry. When we use Boston Consulting Group's Environments Matrix, (Grant 1991) the aluminum industry is classified as a Stalemate



business. The recommended course of action is first to avoid this type of business. If that is not possible, Grant suggests that one look for a timely exit strategy. While this thinking might apply to some or even most of the countries carrying out this business, it does not apply to Bahrain. The primary reason for this conclusion is that Bahrain, in addition to its endowment competitive advantages such as geographical location and availability of natural resources, has continued to work heavily, since the inception of its smelter, on cost efficiency. Today it is considered one of the few low cost aluminum producers in the world.

When Bahrain made its decision in 1967 to build its aluminum plant, there were twenty-nine countries producing primary aluminum. In spite of the critical importance of power and raw materials in production costs, these twenty nine countries were generally speaking the most developed countries in the world, or the more industrialized of the developing countries. On the whole, aluminum producers have not been from developed countries with large accessible bauxite reserves or large hydroelectricity potential. In addition, there were Japan, Australia, Mexico, Brazil, India, and Taiwan who are relatively industrialized producers. Apart from these countries, there were only the Cameron, Surinam, and Communist China, and in 1967, Ghana among the less developed countries.

At that time, the world primary smelter capacity was believed to have totaled some 7.5 million tonnes. Some 2 million tonnes of this represent a very tentative estimate of the Communist world's capacity. Somewhat over 40% of world smelter capacity was located in North America; almost 20% was located in Western Europe; of the remaining 40%, 25 - 30% was found in the Communist bloc countries, and the remainder in Japan (about 4%) and developing countries of Asia (about 3%) , Africa (about 2% and Latin America (about 1%). (Brown and Butler 1968).

### 1.2. Industry Concentration

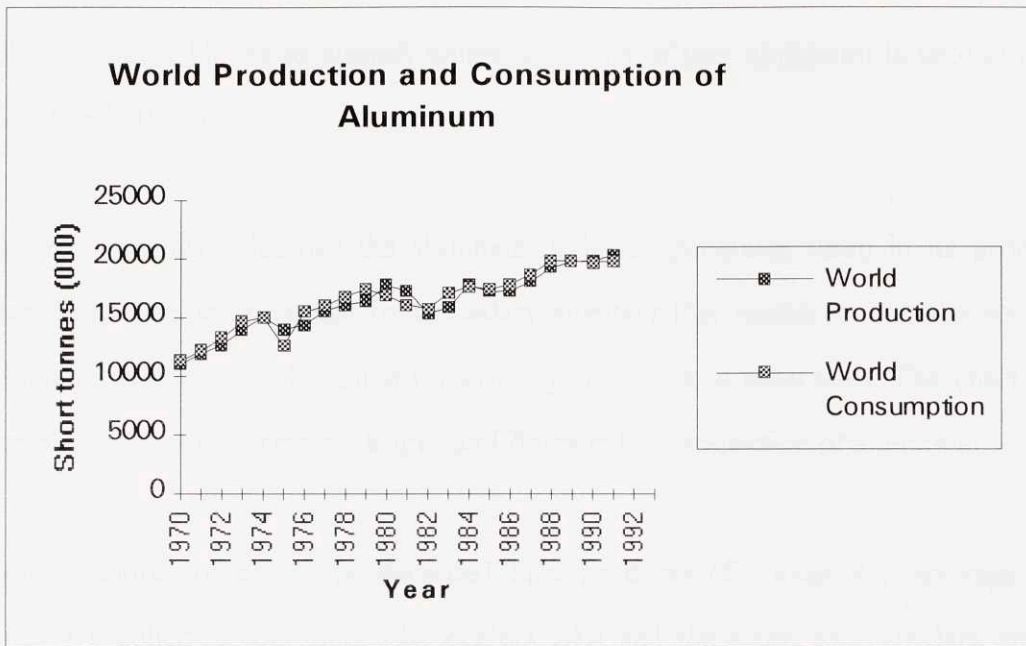
The industry exhibits a massive concentration of power in the hands of a few large companies. Somewhat over 60% of world primary capacity in 1967 was controlled by, or affiliated with, the six major producing companies. The individual shares of these companies were:

<b>Company</b>	<b>Country of Main Registration</b>	<b>Per Cent of World Capacity</b>
Alcan	Canada	14.3
Alcoa	U. S.	14.0
Reynolds	U. S.	11.5
Kaiser	U. S.	11.0
Pechiney	France	7.9
Alusuisse	Switzerland	3.4

(Source: Brown and Butter 1968)

When ALBA first started there was a worldwide production shortage of around 600,000 tonnes per annum. The average annual shortage until 1989 has been around 260,000 tonnes. ALBA's first entry to the market with an annual capacity of 120,000 tonnes has only filled part of the gap.

The following chart shows the industry's supply and demand conditions from 1970 (one year before Bahrain entered the industry) to 1990. The average annual growth rate during this period was around 3.1% in production and around 2.9% in consumption.



Source: Non Ferrous Metal Data by American Bureau of Metal Statistics

In the remaining sections of this chapter I will explain the structure of the industry and then we will take a close look into the history and evolution of the aluminum industry in Bahrain and how it was expanded to reach its current position.

## 2) The Structure of the Industry

The diagram on the following page shows the main features of the industry; the square boxes indicate processes, and the rounded boxes indicate products. Starting at the top the diagram shows that bauxite is mined from ore deposits and converted first into alumina by the Bayer process. Alumina is then converted into primary aluminum using the Hall-Heroult process.

Through a variety of processes common to metal working such as rolling, casting, and extruding, primary aluminum is used to make fabricated aluminum products. Fabrications are used to manufacture items ranging from window frames, household

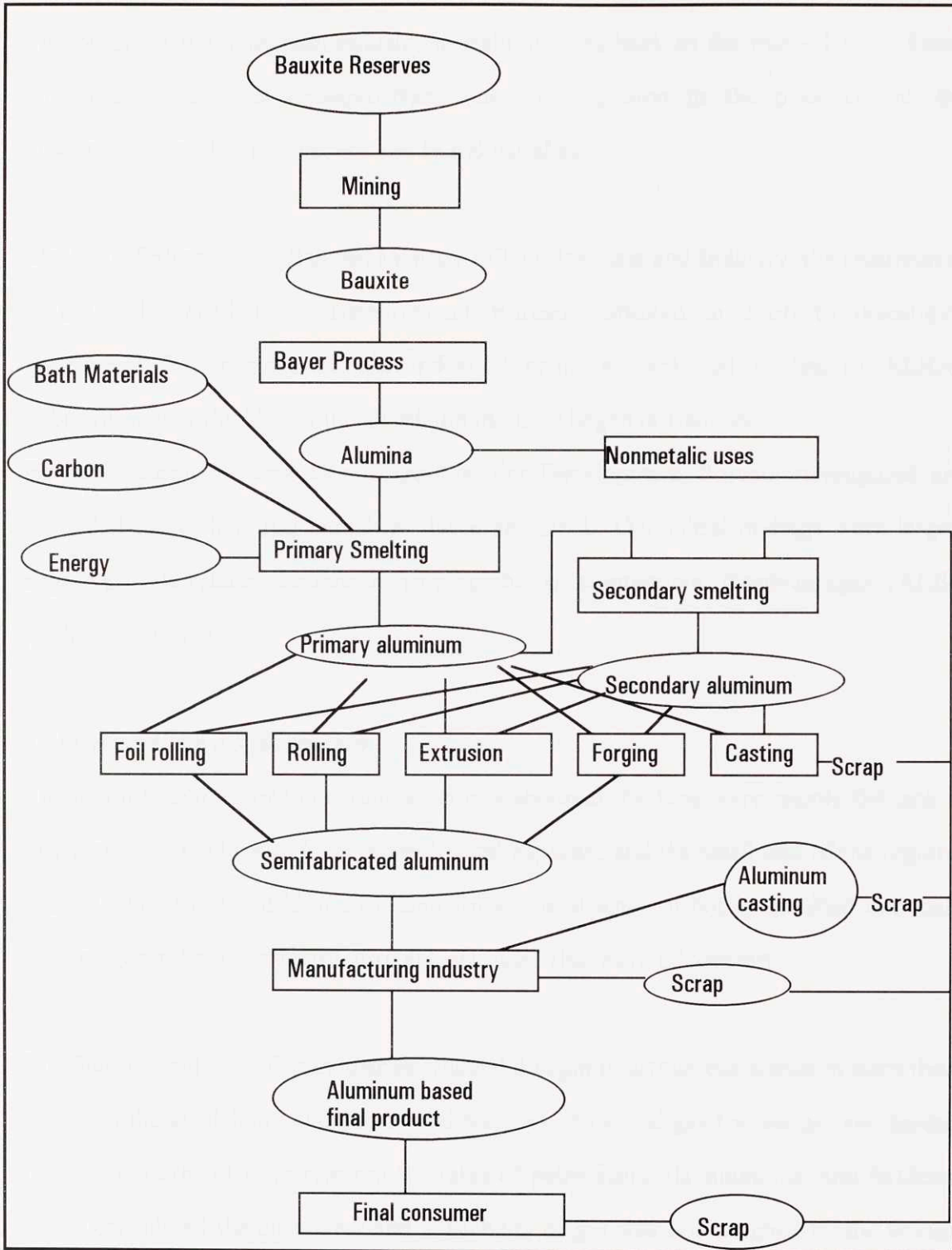
foil, and engine blocks to aircraft wings. In terms of use, aluminum is second only to steel. (Peck 1988).

Like most metals industries the aluminum industry generates scrap in its production operations. The scrap is sent to secondary smelters that remelt it to make secondary aluminum, which can substituted for primary aluminum in most uses. The chart on the next page shows the principal stages and flows in the production of aluminum.

Another source of scrap is discarded final products (for example, beverage cans), which are collected and sorted by dealers who sell the scrap to secondary smelters. Primary and secondary aluminum are close substitutes, and together they form a pool of metal for fabricating. The fabrication of aluminum generally takes place close to its consumption. (Peck 1988). Bahrain consumption of final product compared with its production of primary metal production is negligible.

Although the various production stages are technologically and geographically distance, they are often linked economically by vertical integration. (that is, the common ownership of various stages of production). Peck quoted a study of vertical integration made by Stuckey who estimated that in the late 1970's, 85 percent of the alumina sent to smelters as intracorporate transfers, 15 percent divided between sales under long-term contracts and spot sales. More recent estimates are not available. Vertical integration is still important in the link between the smelting stage and fabrication. In the following chapters we will briefly discuss the structure of the industry in Bahrain.

**Principal stages and flows in the production of aluminum**



Source: Based on (Peck 1988), OECD, Aluminum Industry: Energy Aspects of Structural Change  
(with slight amendment by the author)

### **3) Why Aluminum in Bahrain ?**

#### ***3.1) How the idea began***

The origin of the aluminum industry in Bahrain goes back to the mid - 1960's. Faced with the prospect of unemployment due to stagnation in the price of oil, the government decided to diversify and to industrialize.

Mr. Yousif Shirawi, the Bahrain Minister of Development and Industry, the chairman of ALBA, who headed the Development Bureau instituted in 1966 to investigate alternatives for entrance in new industrial projects, explained in one of ALBA's publication how the idea of the aluminum industry began in Bahrain.

He said "during its first twelve months, the Development Bureau investigated and discarded more than 200 industries, large and small. Our initial findings were largely negative." He related the reasons to a number of competitive disadvantages. (ALBA publication 1981)

#### ***3.2) Competitive disadvantages***

The limiting factors for industrialization in Bahrain at the time were mainly the lack of raw materials, the lack of local technological capacity, and the small size of the regional market. The small and high cost labor force, the absence of highly qualified nationals, and the general poor infrastructure and services, also were of concern.

Mr. Shirawi said " the few industries which did begin to attract our attention were those based on the availability and substantial reserves of natural gas for use as raw material or energy. In the 60's we rejected thoughts of petrochemicals, ammonia, and fertilizers as we considered the cheapness and availability of gas was out weighed by the limiting factors. In addition mammoth projects in these fields elsewhere were reducing unit costs to a fraction to what we can produce here."

### 3.3) *Chance*

It was a coincidence that when the Government of Bahrain was planning to establish industry in the country, there had been an international group of aluminum users who were planning to build a smelter in order to secure their own source of aluminum. They needed a location which enjoyed political stability and which could deliver a cheap source of energy. This group investigated several sites around the world, including Bahrain.

Official contacts between the various parties started in May 1967. By end of July 1968, all negotiations were completed and the first syndicate of shareholders was formed as follows:

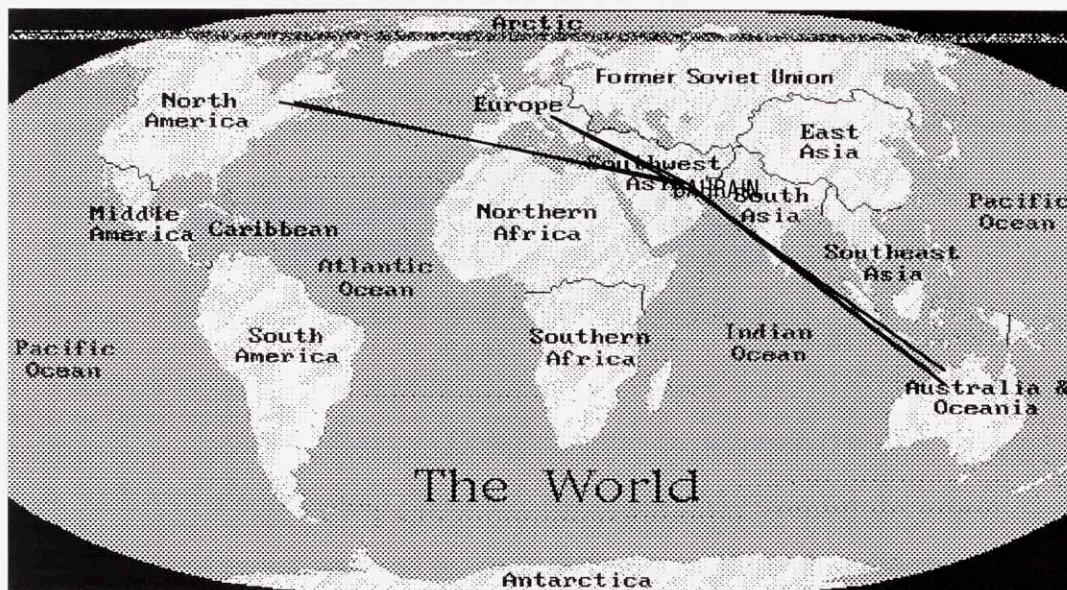
The Government of Bahrain	27.5%
Elektorkeppar	25.0%
British Metal	25.0%
Western Metals	12.5%
Aurora	10.0%

Source: ALBA publication (1981)

### 3. 4) *Competitive Advantages*

Despite the awareness of the limiting factors noted above, the investors found Bahrain well positioned to build a cost competitive aluminum smelter. They realized that Bahrain's geographical location, its rich natural gas resources, and the institutional stability overweigh the competitive disadvantages.

**Geographical location:** Bahrain was found to be well-placed geographically between the source of raw materials, particularly alumina from Australia and the markets for finished aluminum in Europe and the Americas. The production of each tonne of aluminum requires two tonnes of alumina. Having the smelter in the center between the raw materials' suppliers and final consumer would reduce the transportation distance for huge amount of raw material all the way through from Western Australia to Europe and America. In short shipping costs made Bahrain an attractive location for an aluminum smelter. The following map shows Bahrain's position as a center between the source of material in Western Australia and the European and American markets.



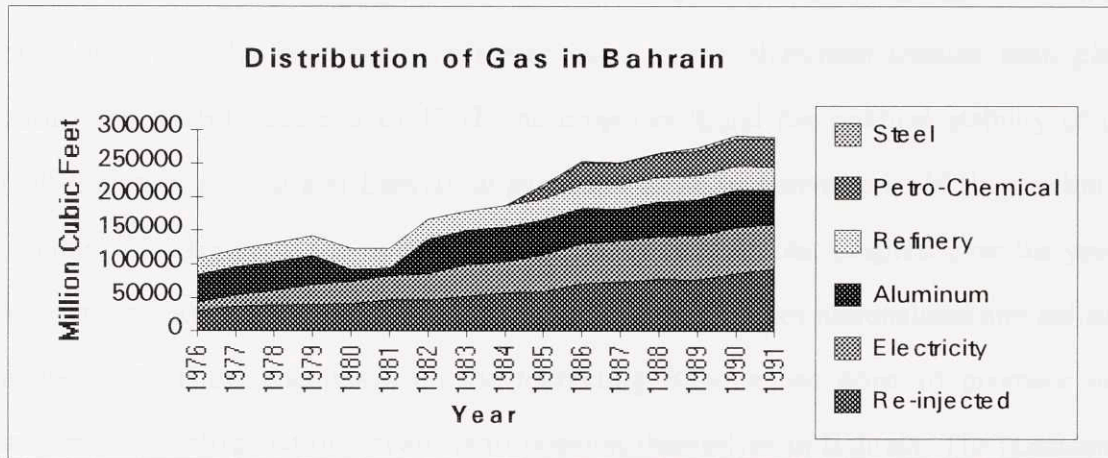
**Natural gas resources:** Aluminum smelting is a power intensive industry requiring a large amount of electrical energy. Many areas have been forced to increase power prices to a level that is prohibitive for smelting, particularly if the power is generated from petroleum fuels.

The most striking feature of Bahrain's profile of aluminum production is the prominent role of the natural gas resources which form a major competitive advantage. In the case



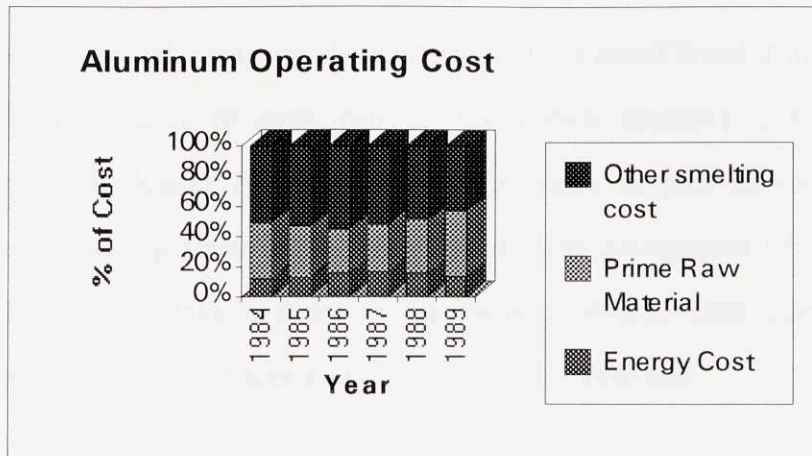
of ALBA, considerable amounts of electric power is generated from local natural gas which was available in large quantities from the Khuff field which used to be flared in the air before the establishment of the aluminum industry.

Since then gas production has been increasing to meet rising consumption and is largely utilized for injection into wells, electricity generation, the aluminum industry, and the oil refinery. The following chart shows the distribution of gas and the trend of consumption during the period 1976 to 1991.



Source: Bahrain's Central Statistics Organization (1991)

When ALBA first commenced operation, the opportunity cost for the natural resource was negligible as excess gas was flared. Building the smelter close to the fields of this natural resource had enabled ALBA to purchase its fuel at a very competitive price. Energy costs which were becoming a major burden on smelters in Japan, Europe, and Americas, were a competitive advantage for the smelter in Bahrain. The following chart shows an estimate of ALBA's energy cost as a percentage of aluminum operating cost prior to the latest expansion.



**Institutional Stability:** Despite the fact that the negotiations between the Government of Bahrain and the first group of shareholders in the aluminum smelter took place during the Arab-Israeli war of 1967, the investors found the political stability of the Gulf region in general and Bahrain in particular as an incentive to build the smelter in Bahrain. This is due to the open economic policy Bahrain has adopted over the years. In contrast with other countries in the region, Bahrain has not nationalized any industry in the past. These together with the marketing Bahrain has done to promote new industries has attracted the investors to position themselves in Bahrain. The confidence of the stability of the island had lead three other shareholders to join the syndicate and buy 8.1% of the Government's share in the newly formed company. By the time ALBA started its production in May 1971 the Government's share was only 19%.

#### **4) Bahrain Aluminum Industry**

When the smelter commenced operation in May 1971, with a planned annual capacity of 120,000 tonne, ALBA had seven shareholders, with the government of Bahrain holding only 19% of the shares. Today with an annual capacity of 460,000 tonne, the company has only three shareholders: the Government of Bahrain with 77%, Saudi Public Investment Fund, 20%, and Breton Investment with 3%. The number of shareholders declined for various reasons. In the 1970's, for example, one of the

original shareholders who were merely consumers of the metal found it inconsistent with their corporate strategy to participate in the capital intensive primary aluminum business. In 1990, Kaiser Aluminum sold their share as part of their decision to generate cash by selling assets in the various plants. The government who had originally showed reluctance to take a stake in the project, showed their confidence in the company by buying up the shares as and when become available.

Net finished metal production is divided between shareholders in proportion to their share holding. A marketing organization, Bahrain Saudi Marketing Company "BALCO", was established to handle Bahrain and Saudi's aluminum sales throughout the world. Breton Investment handle its own marketing.

As a result 97% of ALBA's metal is sold on the open market by BALCO, primarily to the Far East and South East Asia. In recent years there has been a substantial increase in sales to Gulf Cooperation Council states. Today over 80% of the region's aluminum requirements is supplied by Bahrain. (BALCO 1992)

## **5) Growth and Expansion Chronology**

Since its incorporation, ALBA has grown through a gradual programs of expansion and modernization. The rated capacity has risen from 120,000 tonnes per year to the current capacity of 460,000 tonnes per year.

Expansion proceeded as follows:

- ALBA started production in 1971 with an annual rated capacity of 120,000 tonnes from two pot lines.
- In 1981, the company added a third pot line and the annual rated capacity was increased to 170,000 tonnes.

- In 1990, the third pot line was expanded by 76 cells and the annual rated capacity was increased to 205,000 tonnes.
- In mid 1992, ALBA embarked on a major expansion by adding a fourth pot line with an annual rated capacity of 235,000 tonnes started operation.
- During the period 1984 to 1993, ALBA implemented a potroom modernization program in various phases which added around 20,000 tonnes to the annual rated capacity bringing the total capacity to the current level of 460,000 tonnes per year.

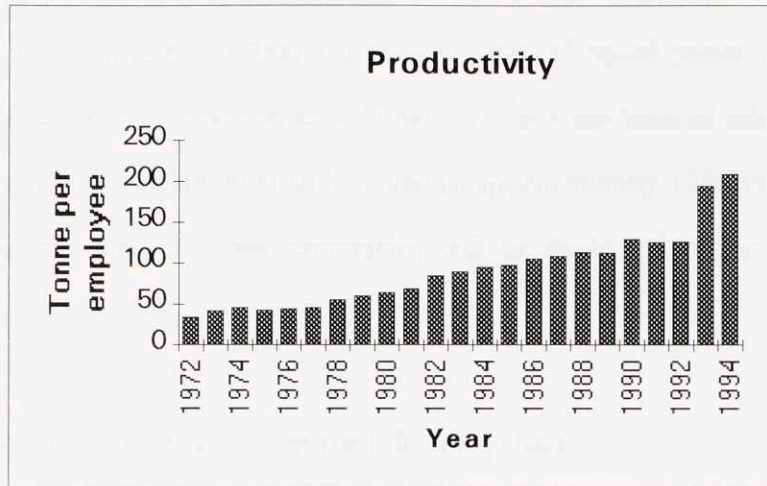
The following chart shows the growth in output since ALBA started production:



Source: ALBA

During the last twenty two years there was a tremendous improvement in productivity which was due to a combination of learning effects and investment in the most up to date technology. The following chart shows that labor productivity has increased from 34 tonnes per man per year in 1971 to 125 tonnes per man per year in 1991 (i.e. before

the start of pot line 4 expansion). Following the full operation of pot line 4, the labor productivity has increased to 209 tonnes per man per year.



Source: ALBA

## **6. Product Market**

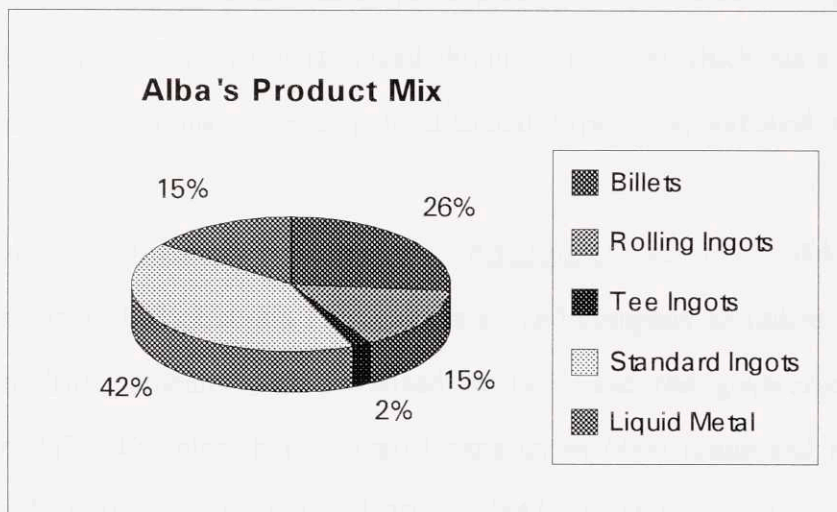
In order to satisfy customer demands, ALBA produces four different products of primary metal. The four types of products take the following forms:

- *Standard Ingot*- 190,000 tonnes per year-used for re-melting and in which form the majority of material is shipped overseas.
- *Tee Ingot* - 10,000 tonnes per year- a larger version of the standard ingot which is produced on a Direct Chill casting station.
- *Extrusion Billet* - 120,000 tonnes per year: This product is produced in various sizes and alloys contents according to customers' requirements. The product is used for the extrusion of aluminum profiles or sections.

- *Rolling Ingot or Slab* -70,000 tonnes per year: The product is used for plate sheet and foil production.

In addition, approximately 70,000 tonnes per year of liquid metal is transported to Midal Cables, Bahrain Atomizers, and Aluwheel which are located adjacent to ALBA's smelter. This quantity is expected to increase to approximately 120,000 tonnes per year by 1997. The products of these companies will be explained under the downstream section.

ALBA's product mix is illustrated in the following chart.



Source: ALBA

Extrusion billet and rolling ingot or slab qualify as premium products with a very high metallurgical standards. Ten percent of extrusion billet production and normally the total production of rolling ingot go to downstream plants in Bahrain. These downstream companies currently consume around 30% of ALBA's output (expected to increase to 52% by 1997). They also engage in further processing of ALBA's primary metal and produce various products as listed in the table on page 84.

## **7) Downstream Industries**

The industrialization in Bahrain has continued since the early 1970's. The growth and expansions of ALBA has led to the establishment of a number of downstream industries in Bahrain. The country now has five downstream aluminum companies which are operated independently from ALBA.

*Bahrain Atomizers International "B.A.I."* In 1972 B.A.I. was incorporated to become the first aluminum satellite industry. Its designed capacity is 6000 tonne per annum and is owned 51% by Bahrain Government and 49% by Breton Investment ( a subsidiary of a German Company). The atomizing plant takes its liquid metal from ALBA. The finished product of this B.A.I. is atomized aluminum powder which has a wide range of applications for paints, inks, fabrics, petrochemical, explosives, and steel industry.

*Bahrain Aluminum Extrusion Company "BALEXCO"* In 1977, BALEXCO was established as a 100% Bahrain Government owned company to utilize ALBA's billet production. The company was privatized in 1993 and the government share has reduced to 44%. The plant has an annual capacity of 6000 tonne and is expected to expand to 12,000 tonne by the end 1994 . BALEXCO produces a wide range of products ranging from aluminum window frames to structural supports for the building industry.

*Midal Cables Limited* was established in 1978. The company is owned equally by Al Zayani Investment (a Bahraini enterprise) and Saudi Cable Co. Currently it has a current designed capacity of 30,000 tonne per annum, which is expected to increase to 50,000 tonne per annum in the near future. Molten aluminum is delivered to the factory

from ALBA and is continuously cast and transformed into aluminum rod and conductor for overhead transmission lines. The company's product is sold worldwide in Asia, Africa, the Middle East and the United States.

Gulf Aluminum Rolling Mill Company "Garmco" is owned by eight shareholders, mainly governments of Gulf countries with Bahrain holding 25.5%. The current annual capacity of the plant is 60,000 tonne. An expansion to 100,000 tonne is being investigated. The company markets its product in most major markets in the world. Today Garmco products are exported to North America, Europe and Japan in addition to serving the needs of the Middle East and GCC countries. During its early years, the company had encouraging figures but faced a number of difficulties during the last few years which are now under investigation.

Aluminum Wheel Company "Aluwheel" Aluwheel started operation in June 1994 as a Joint venture between Al Zayani investment (Bahraini entrepreneur) 51% and BBS - Anteil (German company) 49%. The plant was built adjacent to ALBA and receive its raw material in liquid metal from the smelter by crucibles. Aluwheel produces unfinished aluminum vehicle wheels with current annual capacity of 10,000 tonnes. The wheels are sent to BBS in Germany for finishing. The distribution and marketing is done by BBS to car manufacturers in Europe.



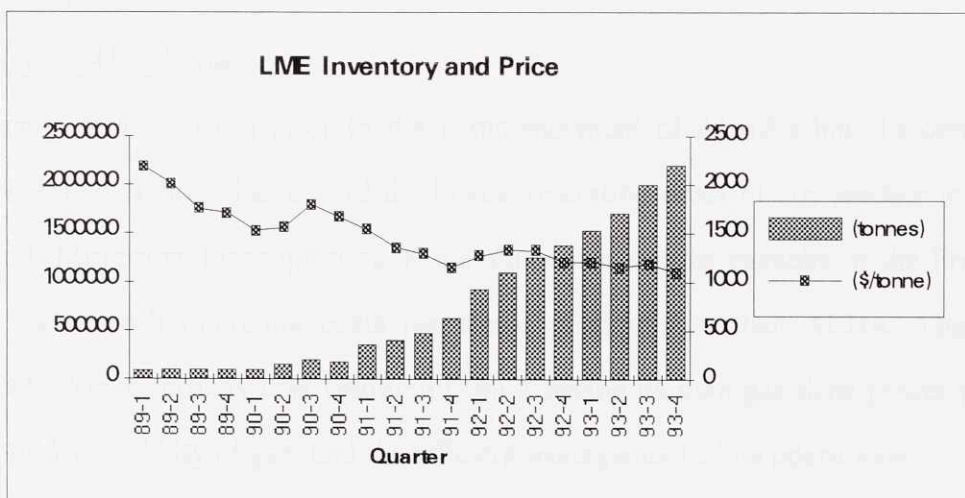
### Chapter 3

## BAHRAIN'S CURRENT POSITION IN THE GLOBAL INDUSTRY

### 1) Industry Condition

The primary aluminum market price has deteriorated dramatically since mid 1988 to a record low level in real terms. The price has dropped from around \$ 2500 per tonne in mid 1988 to below \$ 1100 per tonne at the beginning of 1994. The price decrease is not due to a decline in overall demand, which has stayed relatively constant at around 14 million tonne per year. In addition, there has been no significant increase in new capacity. The dramatic decrease in aluminum prices is due to a sharp increase in inventory resulting from the flooding of Russian cheap metal into the market .

London Metal Exchange prices and inventories for the past five years are plotted on the following chart:



Source: The Aluminum Association Inc. (1994)

The inventory level has increased from 100,000 tonnes in late 1989 to around 2.2 million in late 1993 causing an annual surplus of more than 2 million tonnes. The price has improved to around \$1250 per tonne in February 1994 due to the latest agreement between major producers to cut production.

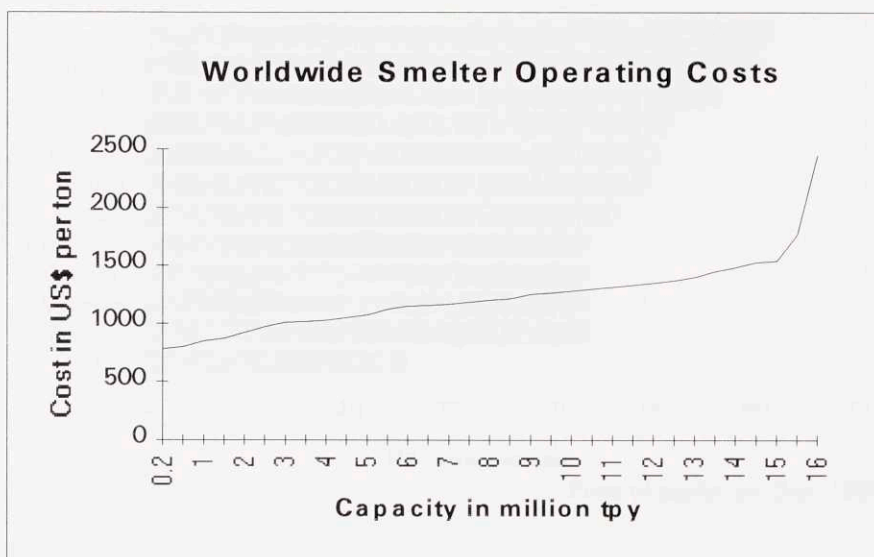
During the last three years and while ALBA was half way through the construction of its line 4 expansion, Bahrain, like the entire aluminum industry, was hit by the Commonwealth of Independent States (CIS) flooding the market with their low cost aluminum. According to the Financial Times, August 16 1993, the Russians claim they produce aluminum at about US \$ 500 a tonne. But energy costs are heavily subsidized and labor rates range from one US cent to two cents a pound - less than those in most developing countries. Antony Bird, an industrial consultant, estimates that aided by these "astonishingly low" input prices, CIS smelters in mid -1992 were producing aluminum for about 25 US cents a pound - well below the 53.6 cents average at smelters in the rest of the world.

## **2) Bahrain Position**

### **2.1) Primary Aluminum**

Industry data prepared prior to the commencement of ALBA's line 4's construction showed that Bahrain has one of the lowest operating costs of any smelter in the Free World. More than three quarters of the aluminum smelter capacity in the Free World has higher cash operating costs per tonne of aluminum than ALBA. This reflects ALBA's low electricity cost resulting from it having its own gas-fired power plant, the plentiful availability of gas, and the efficient management of its operations.

Line 4 has now been operating with its full capacity for one full year. 1993 figures showed some improvements in the operating cost despite the increase in alumina's (its major raw material) prices. Besides line 4, Bahrain has just completed a modernization program of its original two lines which is expected to further improve operating costs. The improvement in operating costs reflects the greater energy efficiency of the new power plant and economies of scale derived from line 4 and the modernization programs.

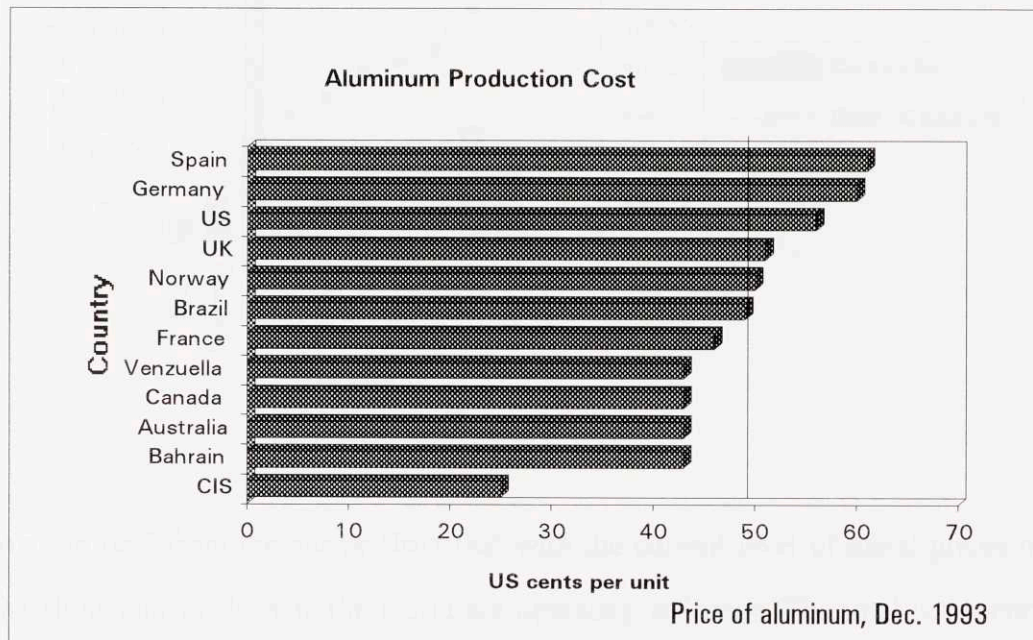


The above chart shows the Free World's smelter capacity which has operating costs at or below a given level. (For example, the graph shows that 10 million tonne per year of the Free World's smelter capacity has operating costs of approximately US \$ 1300 per tonne of aluminum or less). If we plot ALBA's operating cost on the same chart it will appear in the lowest quartile of all smelters capacity in the world.

With this cost advantage the aluminum industry in Bahrain has been enjoying two decades of growth and prosperity. Before its latest expansion, ALBA's cost was about 10 US cents below the average of the rest of the world (very close to Alcoa of

Australia who is considered to be the lowest cost producer) but no way near the Russians.

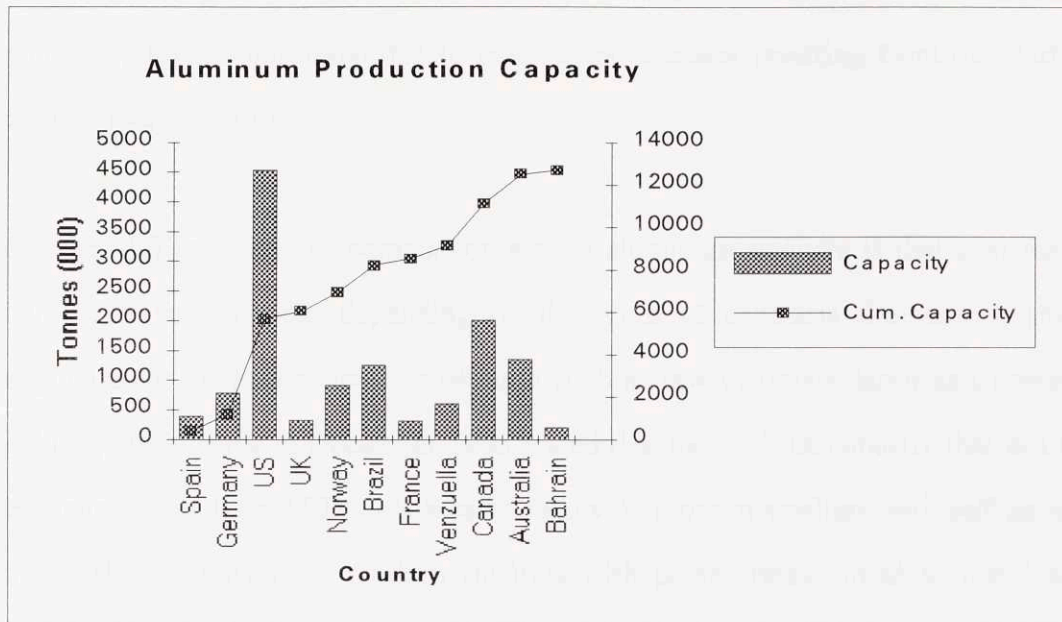
The following chart shows a comparison of aluminum production cost of major producing countries.



The CIS increasing export to the western world has affected the metal price significantly. This unexpected additional metal caused a major imbalance in the market, and as a consequence, primary metal price dropped to and remained around US 1100 per tonne (around 50 US cents per pound) on the London Metal Exchange- the lowest ever in real term. Its only recently (in February 1994) and while working on this thesis, the prices has slightly improved as a result of announced planned cut in production.

The following chart shows the aluminum production capacity in major producing countries as in 1991. Spain, Germany, US, UK, and Norway, who together produce around 8 million tonnes (i.e. more than 50% of the free world total production) would

operate at loss with a market price lower than 50 US cents per pound, while Brazil with 1.2 million tonnes will just break even.



We can read from the above chart that with the current level of metal prices most of the aluminum smelters in the world are operating at losses. The total production cost per tonne for Bahrain smelter is expected to increase during the first few years of operating line 4 due to the heavy interest charges as this project which cost US \$ 1.5 billion was financed 90% by borrowing international commercial banks and export credit agencies. What is more important is the cash flow of the company as the loan repayments and the bulk of interest cost will be made due during these years.

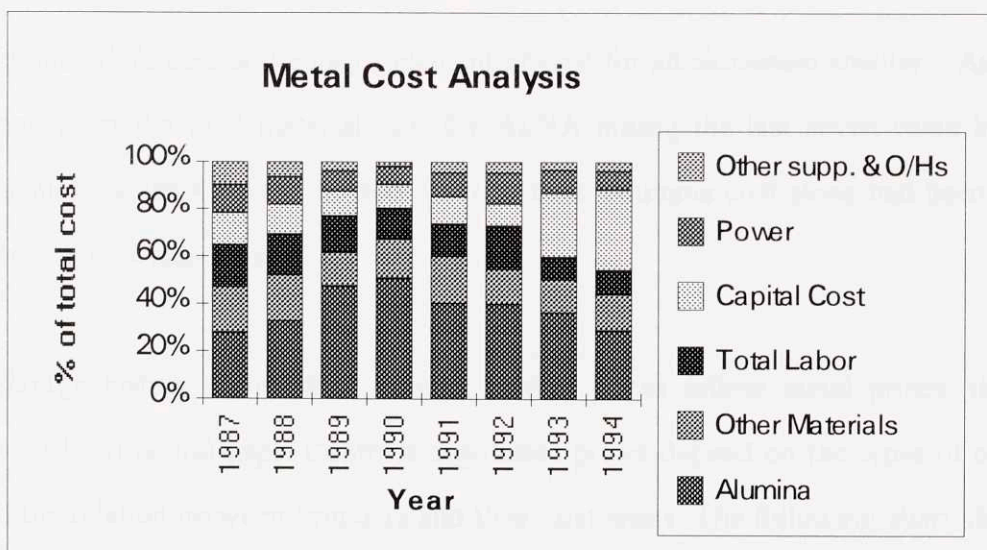
## 2.2) Cost Comparison

One major difficulty in making comparison by elements of cost for the different aluminum smelters is the strict confidentiality on detailed information and the lack of accurate statistics.

Based on the writer's experience in making cost comparisons among different subsidiary smelters owned by a major US aluminum company, ALBA's controllable costs are among the lowest for most of the elements. We expect the various costs per unit to be further improved due to economies of scales resulting from the startup of the line four operation.

Another difficulty in cost comparison among aluminum smelters is that cost rankings vary from year to year depending on the types of contracts the various smelters negotiate for the major elements of input such as raw materials, labor and power. An industry study made in December 1993 stated that most of the capacity that has lower estimated costs than ALBA consists of relatively modern smelters with self-generated hydro electric power, or modern smelters with power rates linked to metal prices. These smelters' cost advantages in recent years have been exaggerated by the low level of metal prices.

A percentage breakdown of ALBA metal cost for the last seven years and the expected cost for 1994 is shown on the following chart:



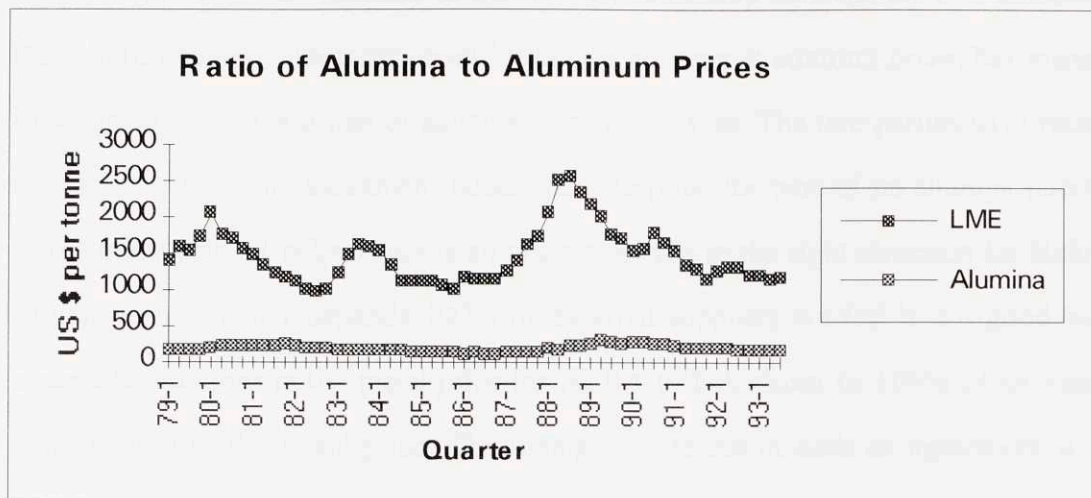
Although Bahrain smelter has been one of the most cost effective smelters in the world during the last two decades, its profitability is exposed, more than most smelters, to the fluctuations in the price of metal. Because of the independence of most of its costs from the metal prices, ALBA can be more profitable than most smelters when the metal price is high, but on the other hand, it can be hit more than other smelters when the metal price is low.

The majority of ALBA's input costs have no linkage to metal prices. Fuel for energy is purchased at a fixed price on a long term contract. (Since the government owns 77% of the smelter I don't think the formula for fuel cost have any significant effect on the profitability of the plant to the country. It is really the opportunity cost of utilizing the natural gas resources in some other projects which matters).

Total labor cost, which formed more than 16% of operating cost (prior to line 4's start up) is mainly fixed wages and salaries in Bahrain Dinar which are reviewed annually upward through merit (and sometimes cost of living) increases.

Raw material's cost is the major element of cost for all aluminum smelters. As per the above chart the total material cost for ALBA during the last seven years had been ranging between 47% and 67% of its total cost. Alumina cost alone had been ranging between 29% and 51%.

Although history shows that alumina market prices follow metal prices, there has always been period gaps. Contract negotiated prices depend on the types of contracts and the relation between suppliers and their customers. The following chart shows the ratio of alumina price to LME- 3 months aluminum CIF price.



During the fourteen years 1979 to 1993 the ratio had fluctuated between 7.5% to 21.2%. In 1981, when the LME 3 month price was US \$ 1164 per tonne, the alumina price was US \$ 247 per tonne. In comparison in 1988 the LME 3 month price was US \$ 2502 per tonne and the alumina price was US \$ 188 per tonne. The chart shows that alumina prices follow the changes in metal price but not to the same extent. It also takes some time for the alumina prices to react. Smelters with contracts based on floating alumina price are therefore expected to be hit twice when the metal price drops. One because of their reduced income and the other is the relatively high alumina cost.

Most of the primary aluminum producers have some bauxite refining capability. Bahrain is the only major primary producer other than Alumax, who buys 100% of its material from external sources. "It is expected" that those smelters with their own resources of raw materials to have some cost advantages in this area over ALBA.

Bahrain has a strong and long term relationship with Alcoa of Australia, its major supplier of alumina. ALBA and Alcoa have always been on long term contract for the



supply of raw material. Because of the strong relationship between the two companies, Bahrain (compared with most countries buying alumina at contract price) has managed to secure competitive prices of alumina since its start up. The two parties have recently entered into a pricing agreement which link the price for part of its alumina purchase to the metal price. I believe this is an important step in the right direction for Bahrain. But since the country depends 100% on external suppliers we feel it is a good hedge against fluctuations in the metal price for ALBA to link closer to 100% of its alumina consumption to the metal price. The timing of entering in such an agreement is also important. At the current low metal price, suppliers tend to protect themselves and ask for a higher percentage. Management should follow the movement in the metal price during its current pricing period and agree with its suppliers at the right time for a metal related price for the remaining life of the contract.

Tying the raw material prices to the metal will cost smelters high raw material prices when the metal price increase and smelters will forego the opportunity of buying raw materials at market prices lower than contract prices. For contracts with annual price negotiation, when metal price drops the negotiated prices for alumina, even if they reduce in dollar terms they are expected to increase as a percentage of metal price.

The metal price started to drop in 1989 from its high level of more than US \$ 3000 per tonne and continued its down trend to the current level of US \$ 1100 per tonne. The market price for alumina, on the other hand has decreased from US \$ 270 per tonne to US \$ 181 per tonne.

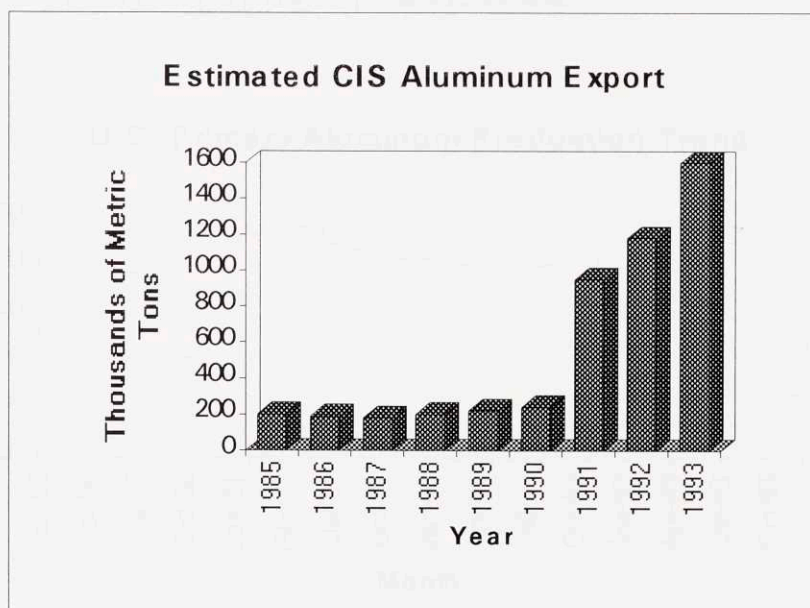
### **2.3) Market Situation**

During the feasibility study for Bahrain's last aluminum plant expansion for additional 235,000 ton per annum, the market study in late 1989 showed that the aluminum smelting industry at the time was under capacity constraints, operating at 98% of

capacity. Given the long lead time required for new smelters construction, it was likely that new capacity expected to come on stream prior to 1995 will at best be sufficient to restore utilization to more normal levels and keep pace with increases in demand. The metal price then was slightly higher than US \$ 2000 per tonne. Using a number of sensitivity analysis, Bahrain justified its expansion based on future prices, lower than that level. In fact much closer to the current price level as the worst case scenario.

Since then a drastic change has happened in the world aluminum market which was primarily due to the sudden flood of exports from Russia and other CIS countries. The Russian exports increased dramatically, that supply and demand became seriously imbalanced. Their exports have grown 540 percent from 250,000 tonnes in 1989 to around 1.6 million tonnes in 1993.

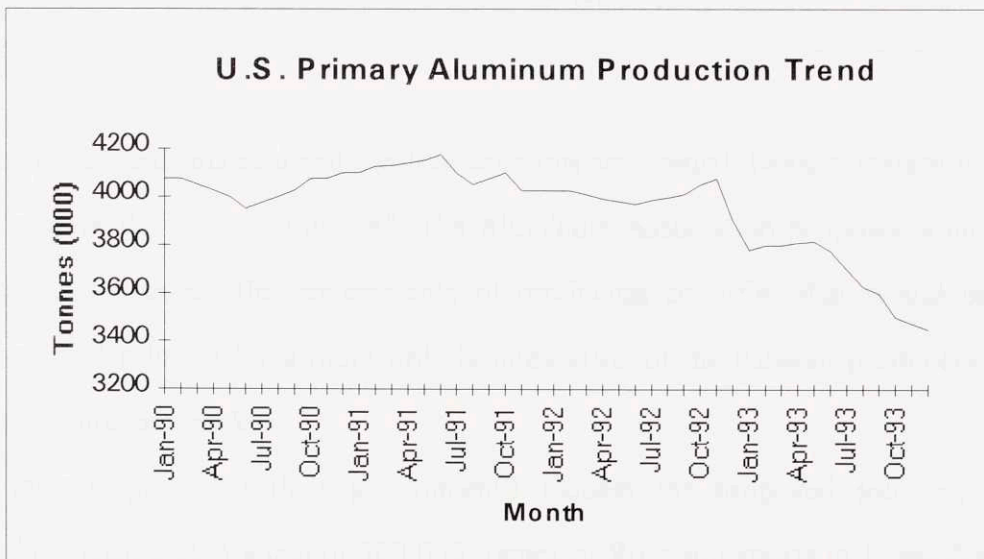
The following chart shows the estimated increase in the export of aluminum by the CIS during the last nine years:



Source: The Aluminum Association Inc. (1994)

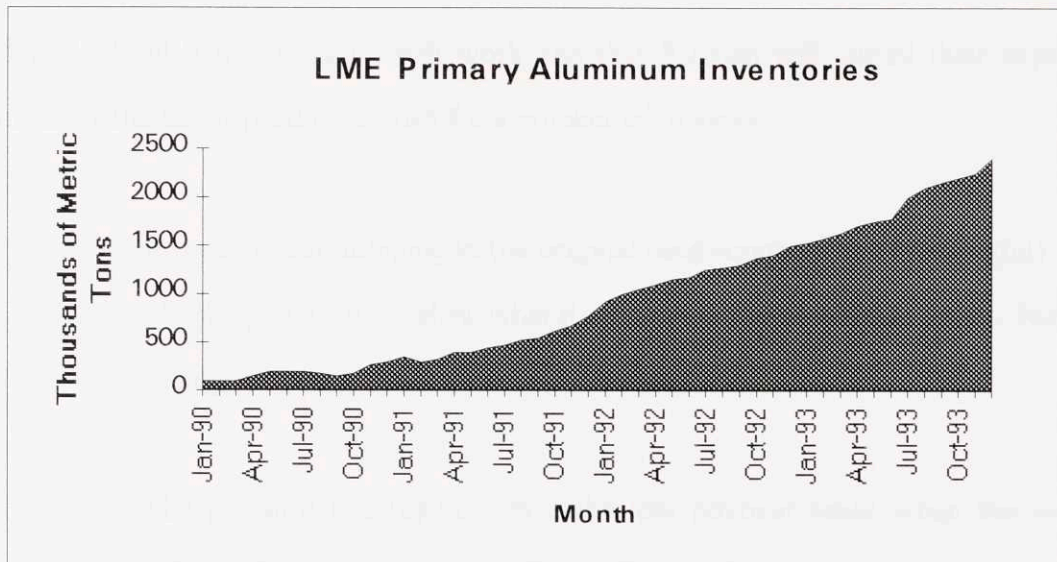
There has been various factors that have led to the low prices of Russian aluminum. According to the Boston Globe, many workers in the Russian industry earn as little as US \$ 20 **a month** and rarely more than US \$ 100 **a month**. Workers in Bahrain aluminum industry earn an average of US \$ 10 **an hour**. In the United States some workers earn as much as US \$ 20 **an hour** (as some Russians earn in a month). Aluminum is also produced cheaply in the CIS because of the impact of state funding. For example, the smelters use considerable hydroelectric power. A spokesman of the Aluminum Association said that in Russia's non market economy, electricity is priced "totally haphazardly" and far below cost.

According to Richard Holder, the chairman of Reynolds Metals Company and the chairman of the Aluminum Association (January 1994), the aluminum industry is now in crisis that is different than anything ever experienced. He stated that since 1991, US producers have cut over 700,000 tonnes of production. This is almost 20 percent of all US capacity shut down in the last two years. As a result 5,000 American jobs were lost and 25,000 indirect jobs are also expected to be lost.



Source: The Aluminum Association Inc. (1994)

Passing the blame on the Russians, Mr. Holder said "US producers have made a very great contribution to solving a problem they did not create". He added "today's global aluminum supply-demand imbalance is a supply problem, primarily attributable to an unprecedented flood of exports from Russia and other CIS countries--Not inadequate Western demand growth". Because of excess supply, there exists a huge build up of inventories by both producers and the London Metal Exchange. LME inventories have sharply increased from less than 100,000 tonnes in 1990 to 2.4 million tonnes at the end of 1993 as shown on the following chart.



Mr. Holder said "unusual and creative solutions are needed. Normal market forces will not resolve the present situation". The Aluminum Association proposed a multilateral agreement between the governments of producing countries that would provide a transitional solution for a more orderly integration of the Russian producers into the world aluminum market.

In their response to their government's request for proposed solution, the US producers suggested a cap of 500,000 tonnes of Russian exports in 1994. Thereafter, exports should be limited to an increase of 10 percent per year. They also estimated

that inventory balance could be achieved by the end of 1996, if worldwide production cuts of 1.5 to 2.0 million tonnes are made.

The United States and Western Europe are putting pressure on the CIS countries to curtail their exports to the US and Europe. The US industry has threatened to file an antidumping suit against Russian export if multilateral talks don't result in an agreement by producing countries to cut world output. Such an agreement would in essence create a global cartel that would clearly violate US antitrust law.

It is doubtful if this pressure will work and that Russian will curtail their export as much as the major producers wish for a number of reasons.

1. Russian is not dumping in the original (and economically meaningful) sense of selling at a price below what it charges in the domestic market. Nor is it selling below its own costs of production.
2. The pressure and restrictions make less political sense when the world's industrialized countries are dismantling trade barriers and attempting to help the CIS transform to a market economy.
3. Smelters managers prefer to export and earn dollars instead of being paid by domestic customers in rapidly depreciating rubles.
4. Russian domestic consumption of aluminum has fallen significantly, for both military and civilian uses. However there have been no production decreases.

5. Aluminum industry in CIS is very highly labor intensive. Curtailing production will mean loss of many jobs which could create undesirable political pressure on the government.
6. As stated by the Financial Times, the CIS smelters are not just making metal- they provide the whole support for the whole communities, including schools and hospitals. Dollars earned provide food, medicine, and smelter equipment.

As a result the CIS has very limited flexibility to reduce production. The American and European pressure is likely to be a short term solution.

In my opinion, one major force which might lead to the reduction of CIS production and as a result, the curtailment of their export is the reaction from their workforce, community and governments towards the pollution in the environment. The Financial Times reported that environmental standards in CIS smelters are appalling. If Russia's own regulation were imposed, all its smelters would close down. The journal stated that a team from the Aluminum Company of America (Alcoa) discovered that a worker's average life expectancy was only 47 years.

Now that Bahrain has completed its expansion and reached an annual capacity of 460,000 tonnes, how is it going to face the challenge in such a disturbed market. Should Bahrain join forces with the other nations in putting more pressure to reduce their export?

First of all, we believe and the US aluminum industry recognize the right of the Russian to full participation in the global market. If we agree with the reasons listed

above, it is only fair to say that the Russians are following the normal business practices in the export of their product which they can produce at competitive prices. The environment issue is an internal problem which many of the smelters have been through in the past. It is questionable whether the Russian can produce at current capacity within the same environment and with their existing smelters.

We can see that the development in the aluminum industry should work in favor of Bahrain in the long term. As mentioned above, during the last two years the US industry has shut down 20% of its capacity due to low prices. Many other smelters are incurring losses but are expecting changes in market forces which will improve the price. It is very doubtful that they can continue much longer incurring losses. In addition it seems that the current negotiations with the Russians will lead to more cuts from the major producers than the cuts expected from the Russians themselves.

Even during the recent most difficult period for the industry, Bahrain has managed to produce at a cost lower than the market metal price. Building on its competitive cost advantages, Bahrain (as ALBA's chief executive, Mr. Gudvin Tofte said) can face the future with confidence. The only pain which Bahrain might face, as explained earlier, is cash flow problems for few years due to repayment of the expansion loans and its heavy interest cost. Anyhow this was expected and planned at the approval time of the project. ALBA's cash cost will gradually reduce with the reduction in their interest cost resulting from the reduction of outstanding debt. Once the loans for line 4 are repaid, the cash cost will drop to a level equal to 1975 in 1993 dollar.

Bearing in mind that shareholders paid only 10% of the total cost of line 4 in equity, it would be short sighted if the performance of the smelter is evaluated on its cash cost during the next few years. With its good financial standing, and its relation with its

bankers ALBA can easily cover any cash shortfall by bridging loans from the banks without claiming it from the shareholders as part of the metal transfer price.

#### **2.4) Environment**

Bahrain is now operating the latest aluminum production technology in its plant. It owns and runs one of the most efficient power plants in the world. The original two lines have been modernized and the whole plant is of a very high environmental standard. According to Mr. Tofte, the BD 94 million (US \$ 250 million) investment in the latest environmental control technology has made ALBA one of the cleanest smelters in the world. Further environmental improvement will be achieved when another BD 12 million (US \$ 32 million) fume treatment plant is commissioned in July 1994.

To continue with its current capacity, Bahrain does not have to incur major capital investments for many years to come, whereas the Russian industry, one day, have to modernize their smelters and invest in improving the environment surrounding their plant if they want to survive. It is difficult to predict the time and analyze the likelihood of changing the environment in the CIS aluminum industry. It appears that there are two conflicting pressures on whether or not to clean the environment:

- a) ***Economic Pressure:*** There is a trade off between cost and benefits. The change of environment will require some heavy capital investment in equipment with no reduction expected in the operating cost. As a result there is no economical incentive for the industry to spend on environment. Even if the industry decide to change, they will require at least five years from the start of their decision to complete the project.



b) **Political pressure:** There are two political pressure which might influence the CIS industry decision on environment. These pressures will have some impacts on when to start the change:

i) **Local CIS:** According to an unnamed source, there are some pursuers from the labor force and the local community to clean the environment. Representatives of the industry have been touring a number of aluminum smelters in the world to learn about the required technology for the change and its cost.

ii) **International pressure:** Some of the aluminum major producing countries who have been affected by the increasing CIS export are threatening to implement trade sanctions on export from the CIS.

To create such improvements, the Russians need to generate extra income, and as a result will require a higher metal price. Re-entry to the market by Western smelters to cover shortfall from Russians supply will be expensive and the price is therefore expected to improve further, though it is difficult to put a time limit on these changes.

ALBA, in contrast, is now considered one of the most efficient aluminum smelters in the world and the company had positioned itself in readiness for the future market upturn. In addition to its current competitive position, ALBA made a plan for the years ahead to achieve further improvements in productivity and reduce operating costs to strengthen its competitive edge. ( Reuters March 9, 1994)

### 2.5) Worldwide Competition

Aluminum is a commodity that is sold in the world market. In an open and free market, any producer who can sell at the market price (in case of aluminum the

London Metal Exchange, LME, price) can be competing in the market. As aluminum ingots cannot be differentiated, those smelters entering the market with good quality produced at low cost will have competitive advantage. Bahrain is doing that, but the market had not been open, fair, and free in the real sense.

Bahrain as well as Dubai (the only two prime aluminum producers in the Gulf) have always felt that they have been discriminated against in the European aluminum market where they have been facing "unfair" trade competition. Neither any of these two smelters has been selling any significant quantities of metal in Europe. Despite the high shipping cost to Japan and the Far East, slightly compensated by the heavy traffic in returning empty containers, the Gulf's sale of aluminum has been directed to that part of the world rather than to the European countries (Livingstone 1987). The main reason for the low metal sale to Europe is the 6.5% duty levied by the European Community on imports of primary aluminum.

Despite the barriers stated above and the negligible volume of the Gulf export to Europe and US (which had no contribution to the current deterioration of market and curtailment of capacities in the industrial world) the major producers in the U. S. and Europe today, are asking ALBA and DUBAL to reduce their production.

The latest efforts of the major aluminum producers have resulted in a "promise" by the Russians to reduce their exports by 500,000 tonnes (i.e. less than one third of their annual export during 1993) with a promise from the industrial countries to help the Russians modernize their plants. The Russians are still adding an annual surplus of 1.1 million tonnes. The total world smelter capacity shutdown (excluding the CIS) since November 1993, as a result, has been 967,000 tonnes.

The aluminum prices as a result has increased to \$ 1230 in late January and to \$ 1310 in early March 1994. This is still about one-third below levels when Bahrain decided in 1989 to double its capacity.

Bahrain has recently decided to cut its annual capacity by 20,000 tonnes in order to participate in the re-establishment of a balance between supply and demand in the primary aluminum market.

This move from the region, despite the unfair trade competition it is facing is considered to be a responsible approach towards solving the world aluminum community's problem. The timing for such decision must be more crucial for Bahrain than the other smelters in the region. Bahrain who has just completed its expansion with 90% borrowing requires a tight cash flow to repay its debts.

## **2.6) Gulf Cooperation Council (GCC) Competition**

In addition to ALBA, Dubai Aluminum (DUBAL) operates in Dubai, the United Arab Emirates with an annual capacity of 245,000 tonne. This brings the capacity in the GCC countries to around 700,000 tonnes per year which equals 5% of the total production in the Free World. DUBAL is considered as a low cost producer but I am unable to make cost comparison with ALBA due to unavailability of DUBAL's cost data. Rather than competing with each other in the Gulf market, the two smelters are cooperating in a number of activities such as joint procurement and shipping of some raw materials and training of labor force. The existence of both smelters in the Gulf has so far not been considered as a threat to each other.

While Bahrain is converting a high proportion of its metal into downstream products, Dubai is exporting almost all its production as premium finished metal mainly to the Far East and (lately) to Europe.

The Gulf market for primary metal is very small when compared with the capacity in the GCC. Bahrain with its export of [10%] to the GCC countries, covers around 80% of the region market. In case of primary aluminum it covers 98% of the Bahrain and Saudi market, 87% of Kuwait, and 20% of the United Arab Emirates.

Bahrain's total export of aluminum has increased from 126,400 tonnes in 1982 to 240,200 tonnes in 1991. The percentage of total export to GCC and other Arab countries has gradually increased from 21% in 1982 to 39% in 1989. Due to the Gulf War, exports to Kuwait and Iraq have dropped in 1990 and 1991 and the percentage of export to the region have also dropped to 27% and 20% respectively.

The following chart shows the trend of export to various destinations during the ten years from 1982 to 1991 :



Source: Bahrain Central Statistics Organization (December 1992)

The question, today, is what will be the effect on the regional industry if the proposed aluminum smelters in the GCC goes ahead. In chapter five I will discuss the

alternatives available for the region to sustain competitiveness in the whole aluminum market.

### CONCLUSIONS

#### THE ALUMINUM MARKET IN THE 1990S

The aluminum market in the 1990s has been characterized by a significant increase in production capacity, particularly in the United States and the former Soviet Union. This has led to a sharp decline in prices, which has had a profound impact on the industry. The industry has been forced to re-evaluate its production and distribution strategies, and to seek new ways to remain competitive. The industry has also been affected by a number of other factors, including changes in government policy and the entry of new players into the market. The industry has been forced to re-evaluate its production and distribution strategies, and to seek new ways to remain competitive. The industry has also been affected by a number of other factors, including changes in government policy and the entry of new players into the market.

The industry has been forced to re-evaluate its production and distribution strategies, and to seek new ways to remain competitive. The industry has also been affected by a number of other factors, including changes in government policy and the entry of new players into the market. The industry has been forced to re-evaluate its production and distribution strategies, and to seek new ways to remain competitive. The industry has also been affected by a number of other factors, including changes in government policy and the entry of new players into the market. The industry has been forced to re-evaluate its production and distribution strategies, and to seek new ways to remain competitive. The industry has also been affected by a number of other factors, including changes in government policy and the entry of new players into the market.

## Chapter 4

### DETERMINANTS OF COMPETITIVE ADVANTAGE

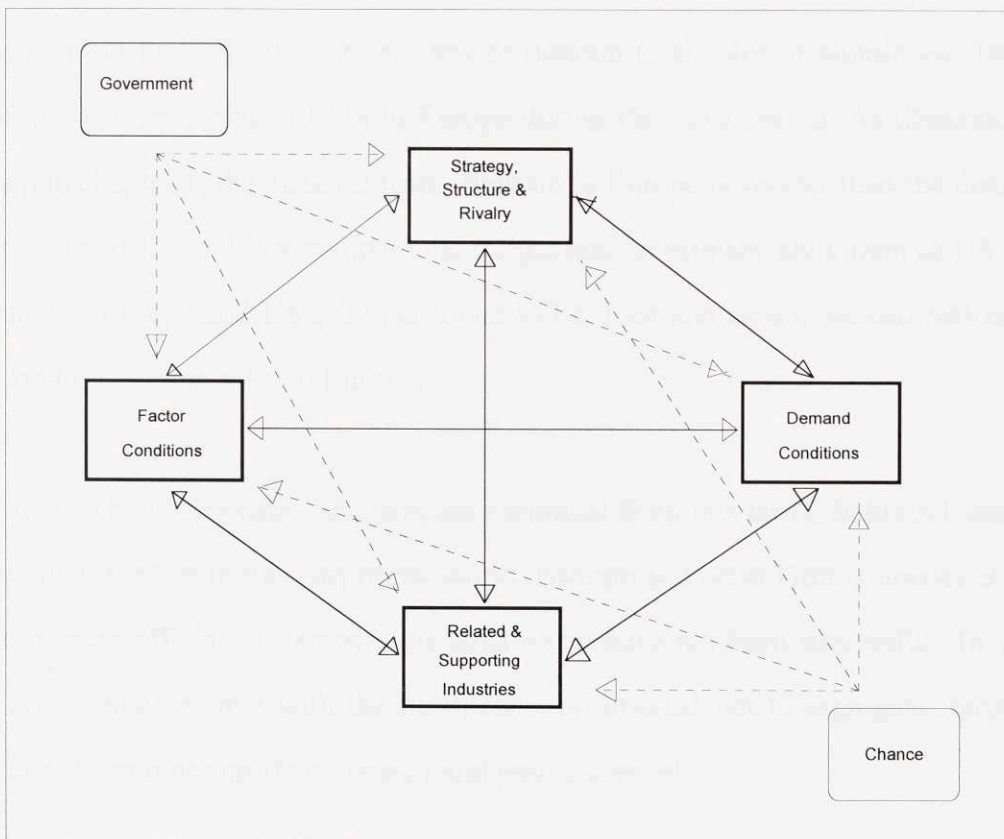
When Porter discussed the Reality of a New Competitiveness Environment in his article *Canada at the Crossroads* (1991) he explained that competitiveness has emerged as a preeminent issue for firms and government policy-makers in every industrialized country. Most efforts to explain national competitiveness have taken an aggregate perspective, focusing on factor endowments, macroeconomics indicators, or government policies. Patterns of international trade have traditionally been explained within the framework of comparative advantage and the traditional theory holds that particular countries gain advantage in those industries that make the most intensive use of the productive factors they have in abundance.

Based on a ten-nation study, Porter came up with the principal conclusion that sustained international competitive advantage results from ongoing improvement and innovation (to encompass technology and the full spectrum of activities relevant to competing in the marketplace), not from static advantages. He stated that creating competitive advantage requires that its sources be willfully upgraded and broadened. He raised the following critical questions, which in my opinion, apply to Bahrain: What is it about a country that supports high and rising levels of productivity in individual industries? In what ways does a country provide a dynamic environment created for their industries? The results of his ten-nation study suggest that the answer to these questions lies in four broad attributes of a country that individually and as a system, constitute the "diamond of national advantage".

The four attributes are:

1. *Factor conditions.* The nation's position in factors of production, such as skilled labor or infrastructure, necessary to compete in a given industry.
2. *Demand conditions.* The nature of home demand for the industry's product or service.
3. *Related and supporting industries.* The presence or absence in the nation of supplier industries and related industries that are internationally competitive.
4. *Firm strategy, structure, and rivalry.* The conditions in the nation governing how companies are created, organized, and managed, and the domestic rivalry.

The following model shows the interaction between the four attributes.



Porter's National Determinants of Competitive Advantage: "The Diamond"

Now let us apply this diamond to Bahrain and its aluminum industry

## **1) Factor Conditions**

### ***1.1) Geographical location:***

Bahrain was originally chosen as the site to build an aluminum smelter because it was strategically placed between sources of bauxite in West Australia and the major potential for customer for the finished products in Europe and the United States.

Bahrain, due to trade barriers discussed above, was denied its right to benefit from this advantage in Europe, and as a result its export to the European countries was not of any significance.

The concentration of marketing has been on Japan and Far East where export for the ten years 1982 to 1991 averaged at 56% of Bahrain total sales of aluminum. This is compared with an average of 8% to Europe during the same period. As illustrated in the map in chapter 1, the distance from Bahrain to Europe is shorter than the distance to Far East and Japan. If we compare the freight rate on primary aluminum of US \$ 32 per tonne to Europe and US \$ 27 per tonne to Far East and Japan, we can realize the effect on low volume sales to Europe.

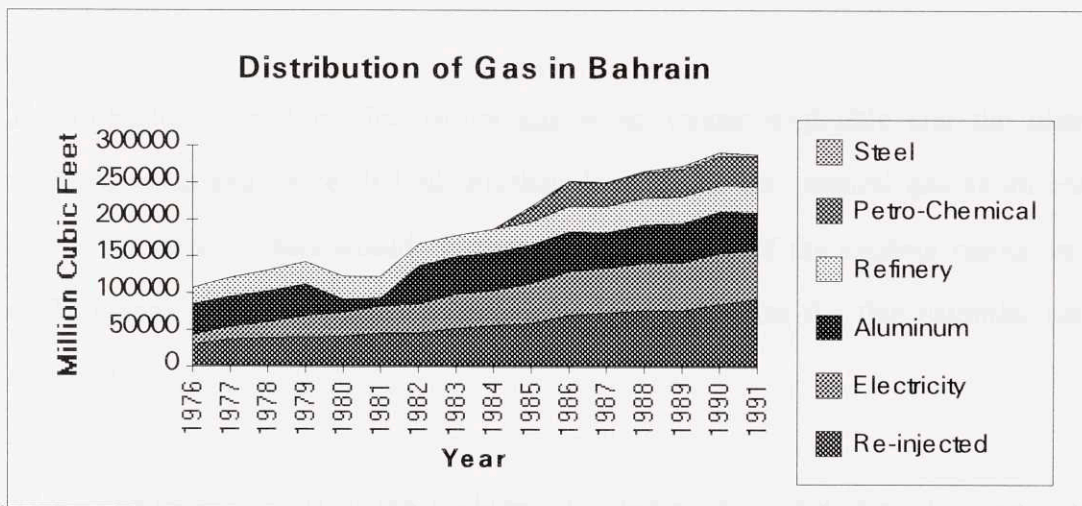
As Canadian and Norwegian smelters are exempted from this tariff, Bahrain losses its competitive position in this part of the world. Bahrain and other Gulf countries efforts with European officials to remove this tariff so far have not been successful . In 1993 GCC representatives met with the European who insisted not to segregate tariff on aluminum from other tariffs on energy and petrochemical.



It is now clear that the originally expected location advantage of Bahrain being a midpoint between raw material resources and final consumers in Europe has not materialized due to European protectionism. Fortunately Bahrain itself has become a much larger destination for primary aluminum products, so location of the various value added aluminum downstream plants in proximity to the primary aluminum smelter has allowed Bahrain to sustain its location's competitive advantage.

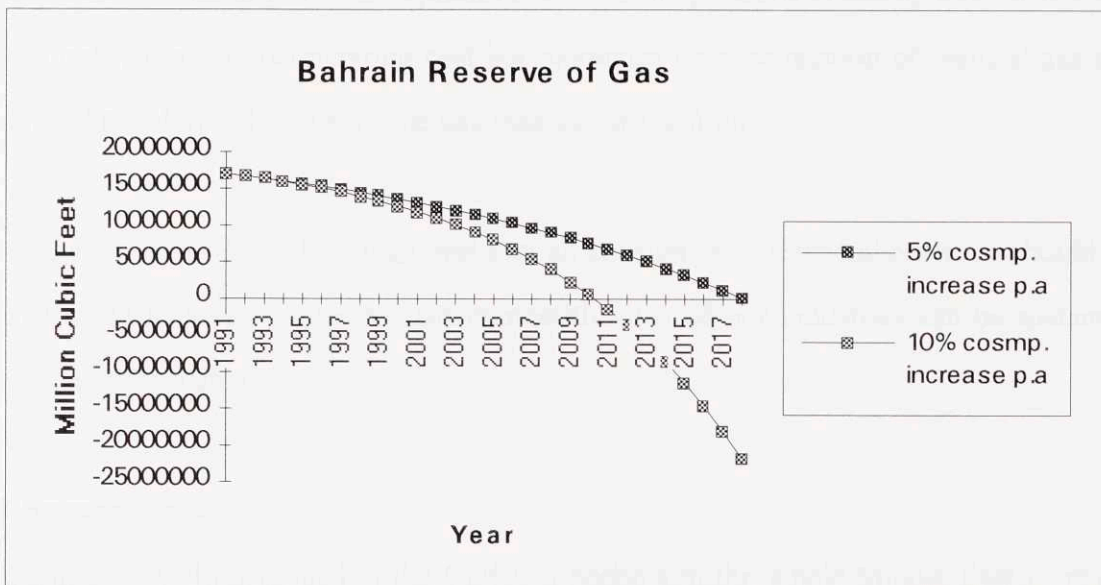
**1.2) Bahrain's energy reserves**

Based on 1991 extraction rate, the reserve of gas was estimated to last for another 60 years (IMF 1992). The following graph which we have discussed under Part I section 4 shows that the average annual increase in consumption between 1976 and 1985 is 12%. The average annual increase in consumption since 1986, when the petrochemical came into full operation, has been around 5%. The total consumption in 1991 has reduced mainly because of ALBA's lower consumption resulting from its modernization of its power station No.2.



If we use 1991 as a base for the future and allow for the increase in annual consumption plus the expected increase in aluminum industry's gas consumption following the start up of ALBA's line 4 operation, the duration of reserves has to be

adjusted. For this purpose I assumed a growth in consumption by 5% per annum based on the rate prior to the operation of the petrochemical and I allowed for 25% increase in the aluminum industry's consumption after doubling ALBA's capacity. The adjusted duration based on these assumption is 28 years. If we try to be conservative and raise the annual increase of consumption to 10% (without adjusting for the increase in ALBA's requirement) the adjusted duration will further drop to 20 years.



The opportunity cost of the natural gas is no longer negligible and the plentiful resource is turning to be limited. Further dependence on natural gas as an energy source for new projects would further shorten the life of the existing resources and could create severe competition among various industries for this essential natural resource.

ALBA, being conscious of the problem, decided as part of its line 4 expansion to invest in upgrading its power stations in order to save in consumption of natural gas. The company which used to have two power stations generating [534MW of electricity] has already invested more than half billion dollars in building the most up

to date and efficient 800MW combined cycle power station. This project replaced the first power station of nineteen old technology gas turbines and accommodated for the requirement of its new pot line. In addition ALBA invested in modernizing its second power station.

Because of these investments, when ALBA doubled its capacity it required only minimal increase in gas consumption i.e. 25% of its previous consumption. ALBA has not only saved on its operating cost but minimize its consumption of natural gas per unit of metal in order to save the gas reserve for the future.

This is an area where, I strongly feel that all consumers of this vital resource should be instructed to invest in, so that the competitiveness of our industries can be sustained as long as possible.

### **1.3) Human resources:**

Bahrain is well positioned in the Gulf and perhaps in the whole Middle East to make available for the industry a mix of labor force which can carry out all levels of responsibilities needed for success in this industry. In contrast to the other Gulf neighboring countries where most of the labor force in industries are expatriates, Bahrain today operates its major industries with a majority of Bahrain nationals. Most of the unskilled jobs in other Gulf countries are held by illiterate foreign labor force. As far as the aluminum industry in Bahrain is concerned, the minimum qualification for Bahrain's who are filling similar jobs is a high school certificate.

From the beginning a very large proportion of ALBA's employees were Bahrain nationals and with the success of its Training and Development Programs, that proportion has steadily increased not only in numbers but in the spread of responsibility.

### 1.3.1) Training Development Program (DTP):

When ALBA first started, all managerial jobs were filled by expatriates due to the lack of national expertise. The company had made a long term plan to Bahrainize these jobs and invested heavily in the training and development of its staff in order to achieve this objective. Employees included in this program are targeted for senior positions within the company including production, engineering, finance, and administration. Each individual's program is divided into phases including on the job training and academic education inside and/or outside Bahrain. The length of the program and the type of training depend on the target position of each individual. As a result, we find today that out of the thirty two top positions of ALBA (i.e. General Managers and Managers), only six are held by expatriates. Around 90% of other management staff positions are also held by Bahrainies. For most of the positions currently held by expatriates there are Bahrainies in the pipelines to replace them in the near future.

### 1.3.2) Apprenticeship program:

In addition to the Training and Development Program described above, ALBA runs its own apprenticeship program through its internal training center. Each year, the company selects some college and high school leavers who join this program for three years. The program concentrate on providing the various maintenance and production departments with the skills required to fill technician and operator positions in these departments.

Because of the common technical base between aluminum production and the downstream products, downstream companies in Bahrain have benefited from the above two programs. When each of the downstream companies started their

operation, they faced no difficulty in finding the right caliber of labor at all levels to start their plants.

The downstream companies are now enjoying the expertise of a labor force that is the product of the above two programs. Currently most of the aluminum downstream companies are participating in ALBA's apprenticeship program. Our questionnaire shows that more than 85% of the labor force in the whole aluminum industry are nationals. Except for Gulf Aluminum Rolling Mill Co. (Garmco), all other downstream companies are managed by Bahrainies majority of whom are ex ALBA's staff.

The industry is now an example to an industrial plant in any developing environment of what can be done with local talent. The availability of Bahraini trained labor who have loyalty and commitment to their firms (which Bahrain was lacking when it first decided to enter this industry) gives Bahrain a competitive advantage within the region. ***This competitive advantage is focused in the availability of a cluster or community of people who possess the relevant technological experience to produce aluminum into its various products.***

### 1.3.3) The role of local education institutions:

In order to achieve more sophisticated competitive advantage and compete in advanced industry with continuing upgrade of technology, it requires human resources with improving skills and abilities. The quality of human resources must be constantly rising if a nation's economy is to upgrade (Porter 1991).

Until today the major companies in Bahrain are depending mainly on their training and apprenticeship programs for the continuous development of their labor force. Some of the smaller companies are taking advantages of these facilities. During the 70's and

early 80's the Gulf Technical College, which had been funded by some of the Gulf countries played an important role during those years in supplying the labor market in Bahrain and other Gulf countries with the right caliber of labor force. The merger of this college with other colleges to form Bahrain University during the 80's have moved the education system in this institution from its technical specialty towards the academic teaching. I find it a burden and a difficult task to achieve for each company to run its own training center which should prepare labors for all fields of each particular industry. I believe it will be more advantageous for all industries in Bahrain to concentrate on the training in fields special to their own industries, while training institutions should provide the market with the general requirements of the industry. These requirements include engineering, administration, finance, and marketing.

It was gratifying to see the establishment and the development of the Government-Run Bahrain Training Institute (BTI) during the last few years. It was reported in late 1993 that BTI was to become the first in the Gulf to be a certified center for industry-related British standards. According to BTI's officials, they are trying their best to provide quality to make Bahraini workers more attractive to employers. They were planning to introduce National Vocational Qualifications across the range of business and engineering programs. With the existence of such institute "which requires the support not only from the government but from all industrial companies in Bahrain", there will be no shortage of skilled workers required for the industry.

#### ***1.4) Knowledge resources:***

ALBA has been a textbook example in the training and development of people for the production, engineering, and administration for the whole aluminum industry in Bahrain. As a result, all aluminum related companies in the country have qualified

national employees in these fields who are now operating and managing the various aluminum down stream plants at very efficient levels by world standards. Given the recent industrialization of Bahrain, the human resources development process was mainly focused on building up technical skills and knowledge to operate and manage such imported technologies, whereas the research and development function was not given enough emphasis and hence there has been a continued reliance on external consultants to perform research and development function on an ad hoc basis by individual firm in the industry.

While all aspects of worldwide aluminum production, process and product, have, over the last one hundred and twenty years, gone through a great deal of research and experimentation, both to develop suitable methods and to understand the characteristics of the metal well enough to envision new application for it, very little local research and development has been done during the twenty three years life of the industry in Bahrain. The lack of emphasis on Research and Development in the aluminum industry in Bahrain was, unfortunately, imminent at all levels; the individual firms, the industry itself, the state, and the local academic institutions.

On the country level, despite its small size, Bahrain has three academic institutions where the required knowledge resources could have been developed and utilized for the development of the aluminum industry. The three institutions are: Bahrain Center for Studies and Research, Bahrain University, and the Arabian Gulf University. Unfortunately, until today there has been no clear coordination between these institutions and the major industrial companies for Research and Development. Though Bahrain Center for Studies and Research has recently taken a lead in arranging for such coordination.

#### *1.4.1) Current Problems*

With the current limitations in the field of Research and Development in Bahrain there has been no continuity of studies for the process of the primary aluminum production and lack of creativity and innovation of new products or differentiation of the downstream existing products. In order to compete successfully and achieve productivity growth, an economy must be continually upgrading. This requires severe improvement and innovation in existing industries (Porter 1991). The downstream aluminum companies in Bahrain are mostly single product's oriented projects and as a result of lack of investment in research and development, the various firms in the industry have, so far, experienced very little expansion of their product range.

One of the main factor that is hindering the investment in Research and Development, is the fragmented structure of the aluminum industry in Bahrain. Aluminum related plants in Bahrain are scattered under different management organizations and on one hand, the individual firms, due to their small size, are not able to justify the establishment of separate Research and Development Departments, while on the other hand, despite, the common Government ownership in almost all these companies, the non-existence of a formalized coordination body, institution or board is not encouraging the collaboration process among the individual firms in the industry.

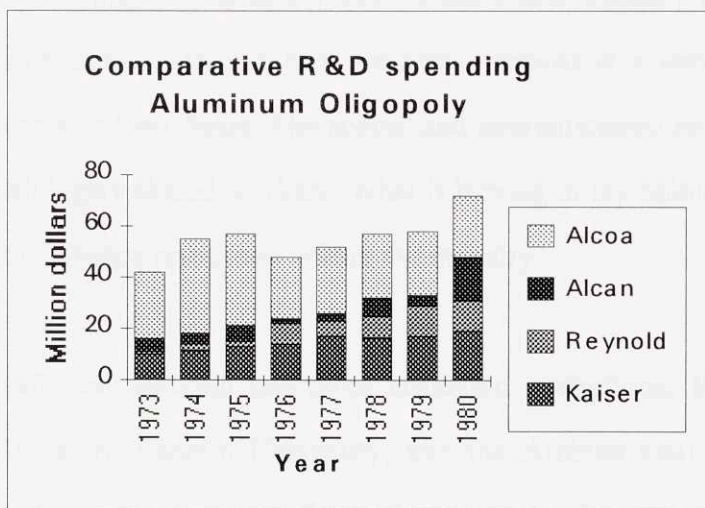
As explained earlier, most of the research and development and technology improvements for the Bahrain aluminum industry have so far been done by external consultants. Some of these consultants are international firms who are considered as competitors in the same business. Yet, Bahrain has been fortunate to purchase up to date technology as and when required. Now that the competition in the aluminum market has accelerated, external competitors might be unwilling to provide their latest technology to their competitors and will prefer to use it as competitive advantage on



their side. As a result, over dependence on competitors for the supply of technology may lead the local industry to lag behind in comparison with the rest of aluminum producers.

#### 1.4.2) Investment in Research and Development

Reviewing the annual reports of various major aluminum companies in the world, I find that the average R&D expenditure in the aluminum industry is 2.5% of their sale. Bahraini companies' investment in Research and Development is no where near this ratio and in fact their allocation for such function is non significant with the exception of cost of purchased technologies which is paid for as part of the overall projects' cost and it is very difficult to identify. Based on worldwide companies' investment ratio in R&D, Bahrain could be expected to spend between six to seven million Bahrain Dinar, (sixteen to twenty million U S Dollars) per year on R&D. The following chart shows the amount spent by four major aluminum companies in the world during the period 1973 - 1980. Unfortunately, the annual reports of some of the companies on the chart do not show the research and development costs for the last few years as separate item.



Source: R&D Committee records, AA- Boyers. (through Graham and Pruitt 1990)

It is important for Bahrain to recognize the importance of research and development function for this industry. The country could face difficulty in sustaining its competitive advantage in the long term if major producers put more restriction on their technology transfer. Bahrain will need a long time and heavy investment to regain its existing market position in the world market. According to Graham and Pruitt in their book, R&D for Industry, following Alcoa's profit margin deterioration in the 1970's, Alcoa in early 1980's had to rediscover its dependence on science as an essential feature of its existence. Only when that dependence was reaffirmed could the necessary structural changes take place to rebuild an organization capable of supplying and implementing a coherent technical vision for a new era. Hindsight suggests that Alcoa, like many other companies at the time, was going through a self-imposed aging process, having largely cut itself off from its traditional sources of technological renewal. It required more than a decade to reconnect with them.(Graham and Pruitt 1990).

ALBA has been the primary source of training and development of people for the production, engineering, and administration of the whole industry in Bahrain. Almost all aluminum companies in the country are now operated at a very high standard by professional people in their fields. The specialized apprenticeship program is providing the industry with highly skilled workers. What is lacking in my opinion is Research and Development knowledge resources within the industry.

Despite its small size, Bahrain has three academic institutions, Bahrain Center for Studies and Research, Bahrain University, and the Arabian Gulf University, where knowledge resources can be utilized for the development of the industry. Unfortunately, until today there is no clear coordination between these institutions and

the major industrial companies for studies and research in the various industries. Though Bahrain Center for Studies and Research has recently taken a lead in arranging for such coordination.

While all aspects of aluminum production, process and product, have, over the last one hundred and twenty years, required a great deal of research and experimentation, both to develop these suitable methods and to understand the characteristics of the metal well enough to envision new application for it, only very little local research and development has been done during the twenty three years life of the industry in Bahrain.

ALBA, since its inception has not only been producing aluminum but producing its anodes and generating its own power as well. The company in the near future is expected to produce its requirement of water and calcined its petroleum coke for carbon anodes.

To ensure the best reduction process of aluminum, the best quality of carbon anodes, and the proper utilization of gas, ALBA currently appoints consultants on ad hoc basis to do research for the company. The other downstream companies also employ consultants occasionally to do market research and advise them on their process as and when required.

In order to compete successfully and achieve productivity growth, an economy must be continually upgrading. This requires severe improvement and innovation in existing industries (Porter 1991). In response to our questionnaire some of the downstream companies stated that one of their competitive disadvantages is the limited range of products.

It appears that there is no continuity of studies for the process and there is a lack of creativity and innovation of new products or differentiation of existing products. Apparently, this is mainly due to the way the industry is organized. As the different aluminum plants are scattered under different management, it might be not justified for each company to train and have its own Research and Development department. Although I do not have access to how much is spent by the various companies on external researches by consultants, I can guess that the total will exceed having one Research and Development center for the whole industry.

## **2) Demand Conditions:**

While the Russian domestic consumption of aluminum has fallen significantly, for both military and civilian uses which contributed to their increased export, Bahrain domestic demand for primary aluminum has increased during the recent years due to the increase in and expansion of the downstream industries.

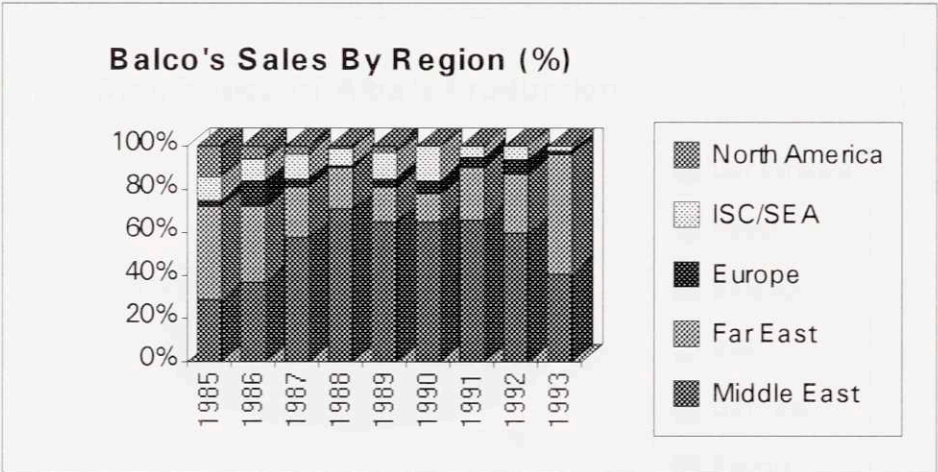
In addition to Bahrain Saudi Aluminum Marketing Company "BALCO", which carries the marketing activities for the entitlement of the government of Bahrain and Saudi Public Investment Fund's in ALBA's production, Bahrain currently have five other downstream companies.

The table on the following page summarize the activities of these companies.

	<b>Midal</b>	<b>BAI</b>	<b>BALEXCO</b>	<b>Garmco</b>	<b>Aluwheel</b>	<b>Total</b>
<b>Capacity</b> in tonnes						
Current	50,000	8,000	12,000	65,000	10,000	150,000
By 1997	90,000	8,000	20,000	120,000	10,000	228,000
<b>Share Capital</b> \$000	8,000	1,223	27,600	112,766	32,000	181,589
BG share		624	12,100	28,720		41,444
Bahrain's share	4,000		8,800		16,320	29,120
GCC share			6,700	71,280		77,980
Others	4,000	599		12,766	15,680	33,045
<b>Labor</b>						*
Executive	12	3	15	23	N/A	53
Non-Ex.	158	45	229	543	N/A	975
<b>Product</b>	O/H conductor Wires Redraw Rods Alloy Rods Tubes, Strips Solid Sectors	Powder Pellet	Commercial Systems Engineered Merchanted	Coil & Sheet Can End Can Body Litho Circles	Unfinished Car Wheels	
<b>Market</b>			{8,000			
Bahrain			{	16,250		30,250
GCC	6,000			33,150		54,650
Far East	16,700	4,800		4,550	10,000	33,600
Europe	16,700	2,400		8450		9,250
US		800		2,600		13,200
Others	10,600					
<b>Compt. Advantage</b>	Quality Location Freight Remelting - cost	Quality Logistic Cost	Quality Reliability Local sale people Proximity to ALBA	Quality and Flexibility production cost	Good foreign alliances. Location. Remelting - cost	
<b>Compt. Dis-advantage</b>	Duty in foreign market No export incentive	Small quantity	Regulation in GCC No integration One Press Need to subcontract	Distant export market. No integration Limited product range.	No local market.	

Source: Questionnaire (Aluwheel: estimate)

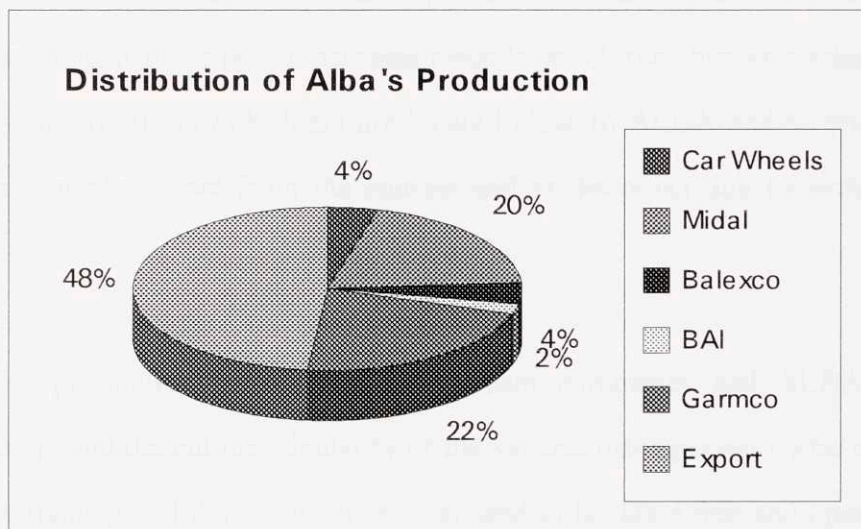
The following chart shows the distribution of ALBA's production for the nine years from 1985 to 1993. The table below shows that sales to the Middle East (mainly Bahrain) has increased from 29% in 1985 to 66% in 1991. Although there was a drop in the sale's percentage in 1992 and 1993 to Middle East because of the increase production from the new reduction line, the actual sales tonnage to this region has increased from 136,000 tonnes in 1991 to 180,000 tonnes in 1993.



Year	85	86	87	88	89	90	91	92	93
Middle East	29	37	58	71	65	65	66	60	41
Far East	43	35	23	19	16	13	24	27	55
Europe	3	12	4	1	4	6	5	7	2
ISC/SEA	11	10	11	8	12	16	5	6	2
North America	14	6	4	1	3	0	0	0	0

Source: BALCO's annual reports

In line with ALBA's expansion, the downstream companies have been expanding as well. The government has been encouraging investors to build new aluminum related projects. A number of expansions have been completed and others are still in progress. Based on our questionnaire to the downstream industries, the capacity under construction now shows that the total downstream' capacity *in Bahrain only* will reach 52% of ALBA's production in 1997. In tonnage term this is an increase from the current 143,000 to 238,000 tonnes per year. The following chart shows the planned distribution of ALBA production locally and overseas by 1997.



The existence of these plants in Bahrain and their close location to ALBA give them some competitive advantages. In addition to the advantage of high quality metal, the transport cost of metal to the various locations in Bahrain is very negligible. Scrap from these plants are reconverted by ALBA into metal and returned at tolling cost.

Delivery of molten metal to Aluwheel, Breton Investment, and Midal Cables allows these plants to produce their finished products with no remelt costs and immediate through put of the liquid aluminum results in lower finance and holding costs. These plants also receive discounts on their purchase of metal as ALBA save cost for not

casting these quantities of metal in its cast house. These facilities make the production of these plants who sell their products worldwide very cost efficient that enables them to internationally competitive.

### **3) Related and Supporting industries**

The presence of ALBA as internationally competitive supplier in the world aluminum business in Bahrain creates advantages in downstream industries in several ways. The first is through efficient, rapid and preferential access to the most cost-effective inputs. Some of the downstream aluminum producers in the world who needs molten aluminum as their input require to remelt ingots which they buy at market price. Such downstream producers in Bahrain are located close to ALBA and receive their liquid metal in crucibles direct from the smelter and at discounts due to saving in casting process.

The close proximity between the downstream companies and ALBA, the strong relationship and the cultural similarity of the various management's who came through the same training and development process tend to facilitate free and open information flow and create strong working relationship. Changes in downstream input materials required for the satisfaction of customers new orders can easily and quickly be communicated to ALBA where changes to casting process can be made in the shortest possible time.

The mix and the proximity of the various technical and marketing knowledge's of the different downstream companies within the aluminum industry in Bahrain are supposed to form a strength where problems related to the industry can be discussed and sorted out at an early stage. Although some benefits have been gained from this close environment, I do feel that this advantage can be exploited at greater deal if



communication among the various companies within the industry is formalized through a committee representing the management of ALBA and downstream industries. Such close environment should also form a strength in the area of Research and Development.

I have tried to find out from the management of the various companies how the industry can improve in the area Research and Development. Their responses can be summarized that this depends very much on what steps the nation is taking towards developing the industry and the way the industry is organized. If the activities were better coordinated and greater authority were given to the management to diversify into a wider range of products and production of these abroad, the local industry would overtime, build enough expertise to be self sustaining. Research and Development would, of course, be much easier and would in a larger and wider organization also have a much better environment to grow in.

#### **4) Firm Strategy, Structure and Rivalry**

National priority can be attached not only to industries but to particular issues that affect many industries. This can have the same supercharging effect on motivation. In Japan, national campaigns to improve product quality and reduce energy consumption had strong impacts on a number of industries. Japanese firms moved early and aggressively to confront these problems with techniques that helped them succeed internationally (Porter 1991).

The social structure of a nation can have an effect on the competitiveness of the industry. In most Gulf states, working in manufacturing or production industry (other than oil) is still seen as low in status, as a result many of these countries are suffering

from lack of talented people for such industries. In Bahrain this was the case twenty years ago. When the aluminum first started, it was difficult to find Bahrain nationals accepting to work in the production departments or work shift hours. Even when some of them accept the job, it was in most cases lasted for few days. This situation has changed over the years due to a number of factors. External factors such as the depleting oil resources which reduced the level of employment in the oil company coupled with the relatively high growth rate in population have put pressure on people to find jobs somewhere else. Within the industry there has been a lot of environment and working condition improvements. The training programs have made people adapt to this new industry. The pay scale and other incentives such as housing scheme has attracted individual to the industry. Some of the companies in the industry are sharing equally with their employees their annual savings in controllable costs. The savings are distributed in the form of bonuses and building houses for employees with the company bearing up to 60% of the construction cost.

The aluminum industry is now highly admired in the country and Bahrain have the most talented people for the industry in the whole Arab world. The employees now have sustained commitments to their firms. ALBA, for example, has a joint consultation committee representing management and employees. The employees representatives are elected from laborers below manager level. In addition to employee relation, safety, and medical issues, the employees representatives come with ideas related to improving their productivity and increasing the efficiency of the plant. This commitment was very clear during the Gulf War when the smelter has continued its operation around the clock with no absenteeism. This loyalty had also been extended by the expatriates during a period when their counterparts in other businesses left their jobs and fled the country.

This commitment among other factors have contributed to the increase in labors' productivity. The productivity has increased from 40 tonnes per man per year in 1974 to 127 tonnes per man per year in 1990. Following the last expansion the productivity is expected to increase to 255 tonnes per man per year.

Contrary to what Porter suggest that there are benefits from competition and domestic rivalry, our questionnaire shows that although the current management of the various aluminum companies in Bahrain have autonomy in managing and making their own decision for their plants, the management of four out of the seven companies felt that one of their main competitive disadvantages is the non-integration of the industry in Bahrain. For example, BALCO being a separate marketing company under separate management, and without direct relation to the production creates a lack of coordination between the two activities which might reflect on Total Quality and on customer satisfaction. Some economies of scales and expertise can be gained by integrating the various downstream companies where the government owns the majority share holding. Duplication of administration and managerial activities can be avoided. Expertise within ALBA can be further utilized for further process within the integrated industry.

National success in an industry benefits from active internal entry by firms from related industries. Diversification through internal development is almost always through related diversification, because creating a new entry from scratch almost demands that a company possess a base of relevant skills. Knowledge and assets are transferred from the existing to the new business, enhancing the prospects for competitive advantage. Conditions which foster active internal entry into an industry by firms from related fields are a potent source of national competitive advantage.

Porter reported that in the histories of most of the successful industries he studied, chance events played role. Chance events are occurrences that have little to do with circumstances in a nation and are often largely outside the power of firms or national government to influence. The sudden flood of Russian aluminum and the sharp decrease of metal prices in 1990 was unexpected surprise to everyone in the industry. This happened by chance when Bahrain was half way through building its new potline which doubled its aluminum capacity. Porter said while chance events can allow shifts in competitive advantage in an industry, national attributes play an important role in how nation exploits them. The nation with the most favorable "diamond" will be most likely to convert chance events into competitive advantage. In the next chapter I will discuss how Bahrain and the region can build on its existing strength and sustain competitive advantages in the future.

## Chapter 5

### WHERE TO GO FROM HERE

In the previous chapters we analyzed the aluminum industry in general. We discussed the position of Bahrain in the deteriorating aluminum market. We also reviewed the market and briefly discussed the downstream industry and its various products. I gave some cost comparison and commented on the industry competitiveness and discussed the determinants of Bahrain competitive advantages. We have seen how Bahrain has been enjoying two decades of growth and prosperity in this industry. Our task in this chapter is to examine the future issues related to the industry and try to come with some recommendations based on our findings during this study.

A number of factors have changed since the commencement of the aluminum industry in Bahrain. Some of what used to be considered as competitive advantages have turned out to be the opposite, or not as competitive as they used to be. However, given Bahrain's many years experience in the industry, many of the old limiting factors have been overcome and are now considered competitive advantages.

The geographical location of Bahrain as a center between the alumina supply market in Western Australia and final consumer markets in the US. and Europe has not resulted in a significant advantage due to tariff barriers especially in Europe. The opportunity cost of natural gas is now higher than it used to be. Other industries which utilize this natural resource have been developed and the demand for this fuel has increased resulting in reduction in the level of gas reserves. On the other hand, the local market for aluminum has developed significantly due to the growth in the local aluminum downstream companies. Human resources have benefited from the learning curve and the country now

owns a knowledge cluster of people who can professionally run this industry. The local infrastructure such as banking, communication, and transportation systems has improved tremendously and reached a well advanced standard that help in attracting investors, suppliers, and customers to focus on Bahrain as an important player in the industry.

We will discuss the future issues under six headings:

1. Geographical location and Market.
2. Gulf Cooperation Council, Natural Resources and competition.
3. Local Downstream Companies and Integration.
4. Research and Development.
5. Cost Reduction and Productivity Improvement.
6. Risk Management.

### **1. Geographical Location and Market**

Bahrain enjoys exemption from custom duties (GSP status) on primary aluminum in most countries around the world. Unfortunately, the European nations, (i.e. the industrialized markets who are geographically close to this region) are still imposing tariffs on imports of primary aluminum from the Gulf. This barrier has discouraged sales to Europe (which was originally expected to be the main market) and diverting them to distant customers in Japan and Far East where shipping cost are considerable disadvantage.

As part of solving the above problem, the government of Bahrain has successfully created a local market for the primary metal with the establishment of various downstream plants (though the finished products of these plants are still facing the protection from duty in the Far East and Africa). Bahrain has also encouraged private sectors and foreign investors to invest in local industries, particularly aluminum

downstream. The recent joint venture of Aluwheel project between Al-Zayani Group and BBS of Germany is the first result of this strategy. Attracting such foreign investors as BBS who in addition to their technological expertise have a well established market base will help in bringing the industry closer to the customers.

Export of finished aluminum metal is heavily dependent on distant and competitive foreign countries with different social and culture life. In order for Bahrain to sustain its competitive advantages in various markets it is essential that the industry should have some presence in these countries so it can understand and serve the social and cultural needs of their customers in a competitive manner. This can be done with alliances such as the case of BBS, or direct investment in countries with good market potentials through joint ventures with downstream plants in those countries. Such presence and closeness to the buyer will bring information about change in customer needs as early as possible which will allow the industry to benefit from the advantage of early movements to satisfy these needs. Because of language, social, and cultural barriers, some foreign customers prefer to deal with regional institution. This is one of the competitive advantages of Bahrain in the Gulf region because of the local sales force who can understand and interact with the regional customers very easily.

As some of the markets for Bahrain are located in countries with lower manpower costs in the Far East and South East Asia, and as we read in section two of chapter two, the fabrication of aluminum generally takes place close to its consumption. the presence in such markets will add further cost advantages to the market advantages mentioned above.

With Bahrain's increased plant capacity, a wider market base for primary aluminum is required. The advantage of geographical location should be exploited, Now that

Bahrain has become a member of GATT, there should be more trade cooperation with Europe which should abolish the tariff barriers and increase export to that part of the world.

## **2. Gulf Cooperation Council (GCC), Natural Resources, and Competition**

There is an unclear picture of the future capacity of aluminum in the GCC countries. According to a statement made to Reuters by an official from DUBAL in November 1993, DUBAL is planning an expansion of 100,000 tonnes per year. No timing for this expansion was given. The statement added that despite the current drop in metal price, the proposed expansion is a good investment for the future. Both Qatar and Saudi Arabia have been talking, for a number of years, about new smelters with an annual capacity of 240,000 tonnes each.

Because of the nature of the primary aluminum which is considered a commodity that can be sold in the international market, the proposed extra capacity in the GCC (although is difficult to justify based on current prices ) was not expected to affect Bahrain's competitive position in the world market in *normal market situation*. The latest development and the over supply of metal in the world made the market tougher and the competition were severe. Unless the tariff barriers in Europe is reduced, the sale from the Gulf region will be concentrated on Japan and Far East which will create more competition among plants in the region for these particular markets. The additional smelters in the different parts of the Gulf will encourage the establishment of similar downstream companies within the Gulf region which, no doubt will affect the regional market of existing downstream plants.

In addition to the high capital cost for green field smelters, such smelters have to go through a long period of learning (which might last up to ten years) before they can compete on cost and productivity. The metal operating cost, as a result, will also be



high. Established plants, which are currently under pressure to reduce cost and improve productivity will always be ahead of the greenfield smelters who will find it difficult to leap frog the existing smelters.

Bahrain has recently expanded, modernized, and applied the latest technology to its smelter. As a result, it became one of the most clean, efficient, and competitive smelters in the world. Any additional capacity to the existing smelter will require only the addition of the necessary capital investment and marginal operating costs. Based on twenty three years of experience, Bahrain is now well ahead on the learning curve of the industry compared with other countries in the region. Provided that the input resources are available, further expansions of the existing smelter are expected to benefit from economies of scale and result in further improvements in the unit cost of the metal.

One approach to determine the feasibility of green field capacity is to determine the price level necessary to yield satisfactory return to builders of green field smelters, free to locate in any part of the world. Taking this return to be 10% (real) as an average for both equity and debt investors, some studies estimated the necessary price level in low cost countries to be around US \$ 1700 per tonne. In today's dollar this is around 50% higher than current metal prices.

With this comparison between the disadvantages of building green field smelters and the advantages of expanding the existing facilities, it is clear that for any additional capacity in the GCC countries, it would be more profitable for the region as a whole if all members of the council cooperate, coordinate, and build on the competitive advantages of the existing smelters.

The four major elements of input to the aluminum production are: capital investment, raw material, energy, and labor. These elements, together with the know-how, are all available in the region and if utilized properly will make from the GCC a leader in the industry. While all Gulf States have easier access to capital than many other foreign countries, individual Gulf States have strong positions for different elements of input. Bahrain's knowledge of the industry and the availability of trained labor together with the existence of the current facilities make it a central place for the primary smelting in the Gulf. Saudi Arabia, which owns some reserves of bauxite<sup>1</sup>, could refine bauxite (if it is of acceptable quality) into alumina locally and swap its alumina with aluminum from Bahrain. Qatar which owns a huge reserve of natural gas, could swap part of its gas production with aluminum from Bahrain. The importance of energy efficiency was emphasized in the previous chapter. We saw how ALBA's learning curve and its application of latest technology has reduced its consumption of fuel per tonne of aluminum. In fact ALBA has doubled its rated capacity with only 25% increase in natural gas consumption. Since the distance between the Gulf countries is so short, the transporting cost of the gas between the neighboring countries is not expected to add significantly to the total cost of production.

Saudi Arabia and Qatar can benefit from the resources available within the existing plant and take advantages of the economies of scale of expanding the plant without the need to incur unnecessary additional capital cost for building green fields smelters. Bahrain, on the other hand, can benefit from the additional natural resources available in both countries with lower transportation costs than purchasing from distant countries.

---

<sup>1</sup>Bauxite was discovered in Saudi Arabia a few years ago and there have been studies on the feasibility of building an alumina refinery there. If the project turns out to be feasible it should be another important base for clustering the aluminum industry in the Gulf region.

Other alternatives for sharing the benefit of these valuable assets is for the various countries to purchase equity in these related projects. Downstream plants can also be distributed among the participating countries based on mutual interests for the whole region. As an incentive for the other Gulf countries to participate in the expansion of existing smelters, rather than building green field plants, Bahrain may want to allow the other Gulf countries to own share holdings in its existing successful primary and downstream aluminum industries. In exchange for allowing Bahrain to specialize in the upstream portion of the aluminum industry, some of the future downstream projects which do not need proximity to the smelter could be located in other Gulf countries with Bahrain participating in the ownership of these projects.

*Expanding existing capacity, on the other hand will require only the additional capital cost and the marginal operating cost.* The last smelter's expansion, which included the replacement of the old power plant, has cost Bahrain much less than the average green field plant. It was also justified based on lower metal prices than those mentioned above. The Bahrain's smelter has been running for twenty three years and is now 90% operated and managed by nationals at all levels. Although the plant doubled its capacity, the additional manpower was less than 25% of its previous level. If the two green field smelters are built in the GCC countries they will need to recruit approximately 4,000 people, more than 80% of whom will be expatriates. If the same capacity is added to Bahrain plant it would require around 700 people and all will be Bahrainies. If additional capacity is justified, it therefore make more sense to expand existing smelters rather than building green field plants. Both the real and economical return for the GCC countries will favor adding the capacity to the existing smelter in Bahrain.

***Role in the international market:*** Despite the fact that the Middle East countries (including DUBAL and Egypt) currently produce more than 5% of total world primary aluminum, they have little say in what major producers determine for the market. This is mainly because the current regional capacity is scattered among many plants in different countries. The latest discussion between the major aluminum producers in the free world and the producers in the CIS have proposed and come to an agreement on production cuts without the involvement of the smelters in the region. Once the agreement has been reached they tried to impose it on the smelters in the region. Clustering the primary aluminum production in one country under one organization will not only reduce cost of production but will strengthen the role of the region in the industry which will make the major aluminum producers listen to their voice. Joining forces by Bahrain and other members of the GCC in setting and implementing a long term strategy for the development of the aluminum industry based on the experiences gained over the last two decades will give the region a lead in the world market.

### **3. Local Downstream Companies and Integration.**

In addition to its 77% ownership in ALBA, the government owns around 23% of the total aluminum industry in Bahrain. Although close to each other, the various aluminum plants are located in different premises and are managed by different organizations. The various plants buy their metal from BALCO at market prices. BALCO, which represents the two major shareholders in ALBA, is also running its marketing activities in isolation from ALBA's operating activities. Despite the fact that there is some coordination and cooperation between the various downstream companies and ALBA, there have been lot of duplication of activities, especially under marketing, administration, training, and procurement which can be avoided if all these plants become under one umbrella. The gap between the final customer of the finished

product and the initial producer of the primary metal is wide and there are many circles in the chain between the two ends. In case of market problems, it could take some time for the problems to be communicated and resolved through the different organizations.

A good current example of duplication of activities is what both ALBA and BALCO are now doing for improvement of quality. While ALBA is busy with the preparation for accreditation for ISO 9002, BALCO is working hard on implementing Total Quality Management. Although both systems are complementing each other, it would have been of great value, if preparation for both systems had been done under the management of one organization who could have looked at quality management from all angles, i.e. suppliers to customers. Results would have been better and costs lower.

Because of their small size, it is difficult for the individual downstream plants to spend enough time, effort, and money on the development of their human and knowledge resources. It will also be expensive for them to attract expatriates or skilled local personnel to run their operations.

As explained in the previous chapter, despite the autonomy that downstream managers have in running their organizations, a number of them felt (through our questionnaire) that one of their competitive disadvantages is the fragmentation of the industry. The normal advantage of such a structure is to create competition among various companies to make them more competitive in producing the same product. Since the various downstream plants in Bahrain are producing different products, which require almost the same technological knowledge, it makes more sense to integrate the , or at least build a "core" technical industry and benefit from the available expertise with the mother company as well as from the economies of scale and economies of scope by

merging the duplicating activities together. This is specially true for those companies owned mainly by the government.

#### **4. Research and Development**

With the increasing size of the industry in Bahrain, the self dependence on ancillary processes, and in order to encourage investors to invest in further downstream plants, it is now becoming important to establish an aluminum R&D center to serve the existing and future requirements of the industry. These requirements which (as per Bergan and Roberts) deals with questions like advancement of products, technological risk taking, mastery of technologies used, nature of new technology programs, obsolescence, the role of back-room support for new ideas, and priority (with respect to resources) accorded technology-oriented activities, need a long term R&D strategy. Many important R&D strategy issues pertain to the policies that govern the acquisition and allocation of resources. The predominant resource in and R&D organization is people which form the knowledge resource.

Given the relatively small size of the aluminum industry in Bahrain and the fact that the aluminum related companies in the country are all operating plants with modern technologies, the annual allocation of R&D budget should, at least during the initial stages, be geared toward adaptation and adoption of technologies in their process and product development. Their innovation practices should be focused on modification and incremental approaches rather than new and radical changes. Due to the country's overall limited resources, technological leadership in the world aluminum industry in terms of introducing radical and/or new science-based technologies in Bahrain is not foreseeable in the near future. As such it is more practical for the industry to rely on outside sources for acquiring such capabilities, through collaboration with major aluminum companies in the world in sponsoring joint research and studies at major

international research centers and universities. In order to achieve better negotiation power and more cost effective deals with outside parties, this function can be handled by the proposed Research Center or Institution.

ALBA, as we have seen above, has invested a lot in the development of national human resources who are now qualified to run the operation of the whole industry in Bahrain. With the increasing competition in the industry and the increasing significance of Bahrain in the aluminum market, it becomes important for the country to depend on its own resources for R&D. I feel now it is the responsibility of all parties concerned, ALBA, the downstream companies, the local universities, the Study and Research Center, and the State represented by the Ministry of Development and Industry to invest in qualifying national people and to equip laboratories in the plants and the universities to carry continuous R&D studies.

Some liaison with related industry such as oil and gas also need to be made to investigate possibility of better and more utilization of these natural resources. The Venezuelan aluminum smelters, for example, currently are carrying out together with the oil industry a research to produce Petroleum Pitch locally rather than importing Coal Pitch from abroad.

Given the fragmented structure of the aluminum industry in Bahrain, the proposed industry wide research and development approach will increase the barriers to R&D and marketing integration process and such organization will need to be carefully structured, mandated and staffed to eliminate communication gaps, gain appropriate support at all levels and overcome capabilities, perspectives and organizational cultural differences within and among firms of the industry. The following implementation plan is therefore recommended:

- Research and Development function is to be formed as a separate body managed by a board of directors consisting of representatives from the individual firms in the industry and funded by capital allocation from such firms in two folds. One shall be an annual budget allocation based on an agreed formula and the second tier to be provided by any of the participant companies who requests any special research function to be performed on its behalf. Executive management function of this organization to be handled by a hired executive team that among the members, they should possess a wide experience in the aluminum industry, solid research and development skills and diversified personal capabilities including entrepreneurs, various gatekeepers, leaders and coordinators. Such body should have ties with international organizations including aluminum major producers and universities who have interest in the industry.
- As a separate organization, the proposed body is expected to face a lot of challenges in providing service to many individual firms with different priority list as well as in transferring the technologies and receiving feed back from such companies during the different stages of product and process development. Therefore, it is recommended that the proposed organization be run with as flat as possible structure and ensure sufficient involvement of individuals from the various firms in their activities. This can be achieved through formation of task teams for each of their major projects or assignments that include members from the firms who are expected to act as a gatekeeper, sponsors and facilitator. The members of the board of directors of this organization are expected to integrate the strategy and act as coordinators between their respective company and this institution, while the representatives of each firm in the task teams will, in addition to application of their market and technical knowledge, ensure availability of enough



support and awareness in their firms of the progress in the R&D institution, facilitate downstream transfer of projects and upstream information and feed back flow.

## **5. Cost Reduction and Increase in Productivity**

*Under this section I will concentrate on ALBA as it is the major company with the bulk of cost. It has also been an example that is followed by some of the downstream companies.*

Cost reduction in ALBA has been an ongoing activity since late 1970's. The productivity per employee has increased from 34 tonne per man per year in 1971 to 255 tonne per man per year in 1994. As a production company without sales activities, ALBA has always been measured on cost regardless of its bottom line profit. Management has been following a strict cost control strategy with tight departmental budgets. Following the current depressed metal market, management is currently investigating various areas for further cost reductions. This job will not be easy, given that ALBA, today, is one of the lowest aluminum cost producers in the world.

The long standing cost reduction program needs some changes with new ideas that should include the involvement of industrial engineering and more utilization of information technology. Examples are the "Just In Time" inventory system and re-engineering of other works.

ALBA should look beyond its own boundaries to reduce cost, by, for example, involving its suppliers in the cost reduction campaign. The procurement system may

need to be reviewed. Rather than buying material for Just In Case and building inventory, ALBA should move to what is now practiced in the United States by many companies i.e. procurement for Just In Time. (JIT). JIT is a company wide philosophy oriented toward eliminating waste throughout all operational functions and improving materials throughput. To implement the philosophy, JIT techniques provide "the cost effective production and delivery of only the necessary quality parts in the right quantity, at the right time and place, while using a minimum of facilities, equipment, materials, and human resources.

This technique will not be possible for all materials and parts required by ALBA due to distance of suppliers. It could be possible with the high volume of material bought from suppliers who have their agent in Bahrain, for these agents to hold appropriate level of stock determined by ALBA and issue materials to the plant on call. Agents' employees can work full time on ALBA's site under the supervision of purchasing, work with planning department, receive approved material requisitions from various departments, and deliver materials directly to the requesting departments. The idea is that a lot of purchasing, stockholding and administration activities will be eliminated and the user will obtain his material directly from the supplier. The system has been working successfully in the companies who applied it in the States and the savings are remarkable.

*When we talk about cost reduction and productivity improvement we have to talk about Human Resource Management.*

As explained above, the cost reduction program in ALBA has gone so far that it is not easy to gain much more from it in the future. It is the motivation of the labor force and as a result their productivity and creativity which management should

concentrate on in order for the company to sustain its competitive cost advantages and face the challenge of the difficult market in the future. In order to achieve productivity and creativity we need to motivate the people to work for them. It would be difficult to convince an employee to work for these objectives if he feels that his job is possibly the next cost to be reduced. We should look into ways where productivity can be increased without people feeling unsecured on their job.

The management style in the company should be reviewed in order to ensure more participation in decision making from the labor force. We should move from the idea that the "top think and the locals act" to a learning organization style. Leaders' roles, under such an organization, differ dramatically from that of charismatic decision maker. Leaders are designers, teachers, and stewards. These roles require new skills: the ability to build shared vision, to bring to the surface and challenge prevailing models and to foster more systemic patterns of thinking. (Senge 1990)

## **6. Risk Management**

### ***6.1. Fluctuation of aluminum price***

There are two main factors which make the aluminum industry in Bahrain vulnerable to fluctuations in the market price of metal.

- Most of the production cost has no relation to the metal price.
- Marketing and pricing strategies are done in isolation from the production strategy.

Because 100% of the raw materials is bought from external sources, it is essential that ALBA should hedge a good percentage of its cost to the metal market price and avoid paying relatively high prices to its suppliers when the metal price is low.

Alumina is a material which is normally traded with a pricing formula linked to the market price. Since the cost of alumina form the bulk of the production cost , it is advisable to link as much as possible of alumina price to the metal price.

Although the selling price for the primary metal is determined by the market, close communication between ALBA and BALCO with regard to market price and production cost is essential to enable both companies to realize the effect on the profitability for the shareholders of both companies and to work together to improve it. Long term sales contracts should be secured with more of sales forward in declining market i.e. locking in favorable prices. The close coordination between the two companies will give ALBA bases for their negotiation of raw material prices which should be linked as much as possible to the metal price. In fact, the total integration of the two companies would make management more up to date on information related to marketing and production activities.

### ***6.2. Security of Supplies.***

Although Bahrain has not been short of supply of raw material since its inception, and the free market for alumina supply is likely to exceed demand over the next few years, dependence totally on external bodies to supply and ship the material have some elements of risk. ALBA, for example, is the only major aluminum producer apart from Alumax who buys it internal alumina from outside resources and owns no share in any alumina refinery. ALBA also buys its raw materials from its competitors in the primary metal. Consuming closer to a million tonne of alumina per year worth studying the feasibility of owning part of some of alumina resources. Bahrain has recently decided to build its own Petroleum Coke calciner and secure its source of quality material, so why not partly do the same for alumina.

In addition to the alumina, Bahrain import another 200,000 tonnes of petroleum coke and pitch. The transportation is totally done by foreign shipping companies. During the two wars in the Gulf, the industry was under the mercy of these shipping companies. Again I feel from cost saving and security point of view that it is worth studying the feasibility of the company having its own or entering into a Joint Venture with an existing shipping companies to serve the shipping requirements.

## CONCLUSION

The aluminum industry in Bahrain has grown fast during the last two decades. During this period, a number of downstream companies were built which formed a good local market for the primary metal produced by ALBA, compensating for the loss of American and European markets. Bahrain today and after the completion of its aluminum smelter's expansion faces unprecedented challenge due to the high competition created by the oversupply of metal from the CIS. Bahrain has taken some measures to reduce its cost and increase its productivity to sustain its competitiveness in the industry.

Bahrain can draw upon many strengths in the aluminum industry. These include the existence of an efficient smelter with downstream plants, the long term relationship with raw material suppliers, the talented labor force, and the availability of natural gas. With the depleting reserves of natural gas, it is vital for the state to be more conservative in the consumption of this important resource. In order for the aluminum industry to sustain its competitive advantage long in the future, the diversification policy of the country should therefore be diverted to other industries which are **not** gas or oil based.

There are good synergical benefits for the GCC countries to coordinate their activities in the aluminum industry and benefit from and build on the competitive advantages of each country. Joint-Venture and partnerships among the Gulf countries in aluminum related projects built in the right location will lead to a better economical return for the GCC as a whole.

## ***Bibliography***

1. Aluminum Bahrain (1992), *All About ALBA*.
2. Aluminum Bahrain (1972), *Ten Years of Aluminum Smelting in Bahrain*
3. Aluminum Bahrain (various annual reviews and other publications.
4. American Bureau of Metal Statistics (1970 - 1990), *Non Ferrous Metal Data*
5. Bahrain Center for Studies and Research, various authors (1993), *Industrial Investments in GCC: Vision for Future*.
6. Bahrain Monetary Agency (1991), *Bahrain - an International Financial Center*, Bahrain. BMA Publication.
7. Bahrain Monetary Agency (various years), *Annual Reports*, Bahrain: BMA Publication.
8. Bahrain Monetary Agency (various issues), *Quarterly Statistical Bulletin*, Bahrain. BMA Publication.
9. Bahrain Saudi Aluminum Marketing Co. Annual Reviews (1990 -1992)
10. Brown, Martin S. and Butler, John (1968), *The Production, Marketing, and Consumption of Copper and Aluminum*.

11. Directorate Of Statistics (1992), *Statistical Abstract*, Bahrain: Government Press.
12. Financial Times (August 16 1993), Aluminum fence goes up around Europe.
13. Graham, Margret B. W. and Pruitt, Bettye H. (1990), *R & D for Industry, A century of technical innovation at Alcoa.*
14. Graham, Ronald (1982), *The Aluminum Industry and the Third World.*
15. Grant, Robert M. (1991), *Contemporary Strategy Analysis, Concepts, Techniques, and Application.*
16. Holder, Richard G. (1993), Remarks to the Governments of the United States, Australia, Canada, The European Community, Norway and Russia.
17. International Monetary Fund (July 1992), *Bahrain Recent Economic Developments Report.*
18. KPMG Fakhroo (1992), *Investment in Bahrain.*
19. Livingstone, Ian (1989), *Gulf Primary Aluminum- The European Connection.*
20. Ministry of Development and Industry, Bahrain, *The Aluminum Industry in Bahrain.*
21. Ministry of Finance and National Economy (1990 - 1992) *National Accounts.*



22. Peck, Merton J. (1988), *The World Aluminum Industry in a Changing Energy Era*
23. Porter, Michael (October 1991), *Canada At The Crossroads*, Study prepared for The Business Council on National Issues & Government of Canada.
24. Porter, Micheal (1990), *The Competitive Advantage of Nations*, New York: The Free Press.
25. Tushman, Michael L. and Moore, William L. (1988), *Readings in the Management of Innovation*.

## *Appendix*

### *Copy of the questionnaire completed by downstream companies*

#### **A. Share Capital**

1. How much is your issued share capital ?
2. Who are the current shareholders ?
3. What are their share holdings ?

#### **B. Capacity**

1. What is your current capacity ?
2. What changes in capacity have taken place since started ?
3. What are your plans for the future ?

#### **C. Product**

1. What are the different types of your products ?
2. What is your annual production of each product ?

#### **D. Market**

1. What is the geographical distribution for your products ?
2. What is your market share in each location ?
3. What tariff or other trade barriers are you facing in foreign markets ?

#### **E. Competition**

1. Who do you consider are your competitors ?
2. What do you think is your competitive advantage ?
3. What do you think is your competitive disadvantage ?

#### **F. Manpower**

1. What is your total workforce ?
2. What is the percentage of Bahrain's ?
3. How many of your total workforce are management staff ?
4. How many of your management staff are foremen or first line supervisors ?

#### **G. Cost**

What percentage of your cost is primary aluminum ?

#### **H. General**

What are your views regarding future aluminum market ?

*Copy of the questionnaire completed by BALCO (the marketing company)*

1. What is the geographical distribution for BALCO's export during the last five years?
2. What is the freight cost to each of these markets ?
3. What is the size of BALCO's export to each of the GCC's countries during the last five years?
4. What is BALCO's market share in each of the GCC's markets ?
5. Who are the foreign countries that impose tariff on Bahrain's aluminum exports ? and what is the percentage in each of these countries.
6. Where have the GCC countries reached with the European Common Market regarding the tariffs ?
7. What is your views on marketing ALBA's production if the other GCC countries start new aluminum smelters ?
8. What are BALCO's competitive advantages ?
9. What are BALCO's competitive disadvantages ?
10. What is your future marketing strategy taking into consideration the expansion of ALBA?
11. What are your views regarding the metal price and the aluminum market in the future ?