

NCB IN-FOCUS: SAUDI ALUMINIUM SECTOR REVIEW

Shifting Production from the Market Base to the Energy Source

September 2008

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Executive Summary

- Aluminium's unique characteristics and application in numerous industries make it the most used non-ferrous metal in the world.
- It is an energy-intensive, technology driven industry, in addition to being highly concentrated, with a handful of giant companies dominating 70% of global primary aluminium production.
- Players in the industry range between "upstream" primary aluminium producers (primarily bauxite extraction and alumina refining), and "downstream" aluminium products fabricators.
- Known as the "energy bank metal", aluminium has the tendency to be recycled, endlessly without any loss in quality. The recycling process only requires 5% of the energy consumed in the primary production process.
- Given prevailing global conditions, major aluminium producers are adopting two main survival strategies: (1) consolidation through mergers and acquisitions (M&A) due to limited bauxite reserves, and (2) shifting production facilities from the market base to the energy source, given rising energy costs.
- Global demand for aluminium has been growing at around 6% per year over the past decade. In 2007, worldwide consumption reached 37.8 million tonnes. Demand growth is mainly driven by China's booming industrial production, and the rising cost of aluminium substitutes.
- Due to its abundant energy and mineral resources, the Middle East is emerging as a major aluminium producer. Its share of global supply is expected to reach 10% by year 2020, up from 1% in the 1980s and 3% in 2006.
- International commodity prices, including aluminium, are influenced by speculative trading activity in commodity derivatives, triggering price volatility over the short-to-medium term. We believe, however, that market fundamentals and the cost of production are the main determinants of long-term aluminium prices.

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- The Kingdom's aluminium sector is predominantly downstream focused, with no primary aluminium production currently undertaken, due to the absence of local aluminium smelters. Over 106 companies make up the sector, which processes various types of imported aluminium products to produce aluminium fixtures for construction, kitchens, cooking utensils and other aluminium related applications.
- Saudi Arabia is on the verge of becoming a net exporter, if not a global supplier of primary aluminium. Five upstream aluminium projects have been announced in the Kingdom, valued at USD17.1 billion (SAR64.1 billion). Once commissioned, the Kingdom will possess a combined productive capacity of 3.1 million metric tonnes per annum (mmtpa) of primary aluminium by the end of 2012, making it a major global upstream player.
- Four main determinants are fueling the current expansion in the Saudi aluminium industry: (1) government initiatives to develop the non-oil economy, (2) surging local demand spurred by the country's construction boom, (3) the Kingdom's ambitions to emerge as a global upstream player, and finally (4) to monetize the country's abundant proven bauxite reserve base.
- The local aluminium market is currently valued at SAR5.5 billion, with annual consumption estimated at 195,624 tonnes by the end of 2007. Domestic consumption is forecast to grow 37% by 2010, reaching 267,541 tonnes.
- Imports of all types of aluminum products, which are currently the main source of input for the industry, rose 14% to SAR3.7 billion in 2006, while volumetrically it grew by 15% to 385,270 tonnes during the same year. We believe that the volume of the imports will continue to grow at around 10% per annum to reach 564,073 tonnes in 2010.
- Exports of finished and semi-finished aluminium products reached 209,032 tonnes in 2006, and are expected to grow at around 8% per annum to 284,386 tonnes by 2010.

Sector Profile

Key Sector Indicators

	2006	2010	Annual Growth (2006-2010)
Aluminium Market Size , Value, SAR billion	5.3	6.8	8%
Aluminium Market Size, Volume, tonnes	176,238	267,542	11%
Aluminium Capacity , million tonnes	-	3.12*	-
Compounded Aluminium Market Investments, SAR billion	-	64.1*	-
Imports, Value , SAR billion	3.7	4.7	5%
Imports, tonnes	385,270	564,073	10%
Exports, Value , SAR billion	1.3	1.6	13%
Exports, tonnes	209,032	284,385	6%
Impact of Oil Price Movements:	Rising oil prices and ultimately aluminium production cost interna-		

* period ending 2012

Sector SWOT Analysis

Strengths	Weakness
<ul style="list-style-type: none"> Robust global and local demand for aluminium driven by the construction boom in GCC countries and in emerging economies, in addition to the industrial boom in China. Positive outlook for oil and the economy over the medium-term, signals continued growth in public and private spending on construction. Abundant and cheap energy reserves in the Kingdom are attracting global players to take part in the expansion of the aluminium sector. Ongoing government initiatives aimed at developing the mining and minerals sector as the third pillar of the economy. Availability of substantial proven bauxite reserves, needed to support vertically integrated mining to metals production processes. Aluminium smelting is complementary to the Kingdom's oil resources, since energy costs account for nearly 40% of the total cost. 	<ul style="list-style-type: none"> Private sector participation is fragmented and underdeveloped especially in the downstream industry, creating significant potential for growth. Government spending on the construction sector is highly susceptible to oil price volatility. Dependence on foreign workforce at all levels of production due to limited supply of local skilled labor with operational experience. Bauxite extracted from Maaden mining projects are not sufficient to meet the remaining announced projects' alumina requirements.
Opportunities	Threats
<ul style="list-style-type: none"> Expansion and development of downstream aluminium industries in the Kingdom, fueled by the local construction boom. Potential export markets in countries with increasing energy costs due to closure of smelters. Establishing re-melting facilities to recycle aluminium will be profitable, as it only requires 5% of the energy consumed in the primary production stage. 	<ul style="list-style-type: none"> Cyclical foreign currencies' movement might increase the cost of imported alumina, machinery, etc. Importing countries might impose tariffs to protect their local industries. Major global players control 70% of the aluminium production worldwide. The rapid simultaneous smelter development/ expansion in the region might lead to slower demand.

1. Overview

The Saudi aluminium sector is currently valued at SAR5.5 billion. It is predominantly concentrated in downstream fabrication activities, processing various types of imported aluminium components. To date, local production of primary aluminium is non-existent due to the absence of aluminium smelters.

Four main determinants are fueling the current expansion in the Saudi aluminium industry: (1) government initiatives to develop the non-oil economy, (2) surging local demand spurred by the country's construction boom, (3) the Kingdom's ambition to emerge as a global upstream player, and finally (4) to monetize the country's abundant proven bauxite reserves base.

The Kingdom, however, is on the verge of becoming a major upstream player in the global aluminium industry. Upon completion, five announced aluminium smelters will supply over 3.1 million metric tonnes per annum (mmtpa) of primary aluminium by the end of 2012, making the Kingdom a net exporter if not a global supplier of the metal. As such, the Saudi aluminium sector has significant growth potential, both locally and in regional and global export markets.

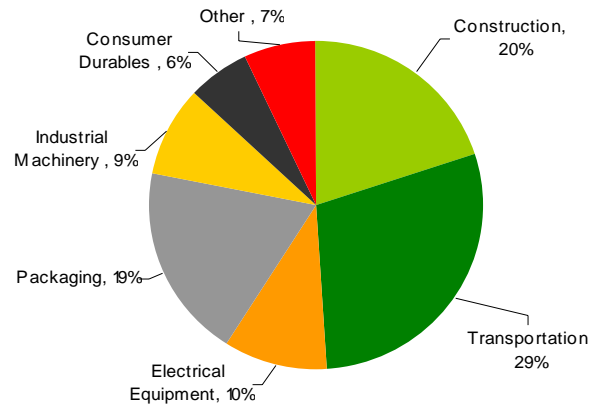
2. Global Aluminium Sector

2.1 Characteristics and Applications

Aluminium is the most widely used non-ferrous metal worldwide, ranking second as the most consumed metal after steel. Aluminium has many extraordinary characteristics that allow it to take part in a wide range of industries. It is extremely light in weight compared to steel (about a third of steel's weight), a good conductor of electricity, transmits heat, corrosion resistant, and most importantly 100% recyclable without any loss in quality.

Among the industries benefiting from these amazing qualities are: construction (consumes roughly 20% of the global aluminium production), transportation (29%) (in the manufacturing of automobiles, trucks, and aircrafts), packaging (19%), and the electrical & electronics industry (Figure 1).

Figure 1. Global Aluminium End-Use Industries, 2007



Sources: AI, Bernstein Research, and NCB

2.2 Production

Primary aluminium production is a technology driven, energy-intensive industry that is dominated by several companies worldwide. These companies control 70% of the world's aluminium production.

The production process starts by extracting bauxite (aluminium ore). The bauxite-rich areas are limited to: Africa (Guinea), Asia (India, China), Australia, Central and South America (Jamaica, Brazil, Surinam, and Venezuela), the CIS (Commonwealth of Independent States) and parts of Europe (Greece and Hungary).

Aluminium is also called the "energy bank metal" because its scrap can be recycled over and over again without any loss in quality. Most of the energy used during initial production is stored in the metal, which in turn is stored in the scrap. Hence, the energy needed to recycle aluminium scrap is approximately 5% of the energy required in the primary production stage (See Figure 2 below).

Given prevailing global conditions, major aluminium producers have adopted two main survival strategies: (1) consolidation through mergers and acquisitions (M&A) due to limited bauxite reserves and rising energy costs, and (2) shifting production facilities from the market base to the energy source.

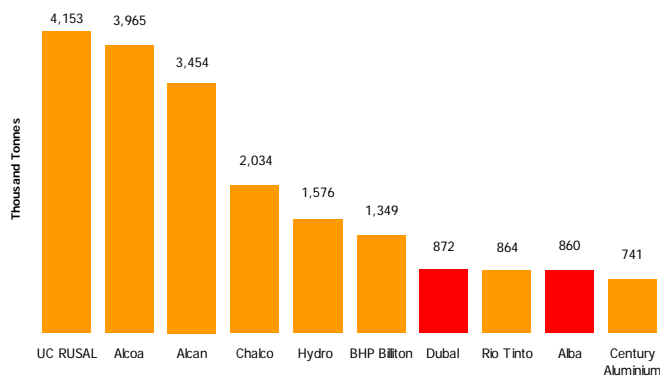
An important example is United Company RUSAL (UC RUSAL), recently formed by the merger of two Russian giants RUSAL and SUAL (Siberian-Urals) alumina property of Glencore AG. Similarly, Australian based Rio Tinto, took over Ca-

nadian Alcan by the end of 2007, which itself had acquired French Pechiney in 2004. In China, Chalco is also overtaking many of the smaller aluminium manufactures.

The announcement of major Joint-Venture (JV) aluminium projects in the Gulf Cooperative Council (GCC), is an indicator of the shifting trend in the production base of aluminum from the client base to the energy source.

Saudi Maaden formed a JV with Alcan to launch a vertically integrated aluminium production site in Ras Az-Zwar, Saudi Arabia. Norsk Hydro of Norway has also established a JV with Qatar Petroleum to develop an aluminium smelter in Qatar. Figure 3 below depicts production output of the global top ten aluminium producers in 2007.

Figure 3. Top Global Aluminium Producers, 2007

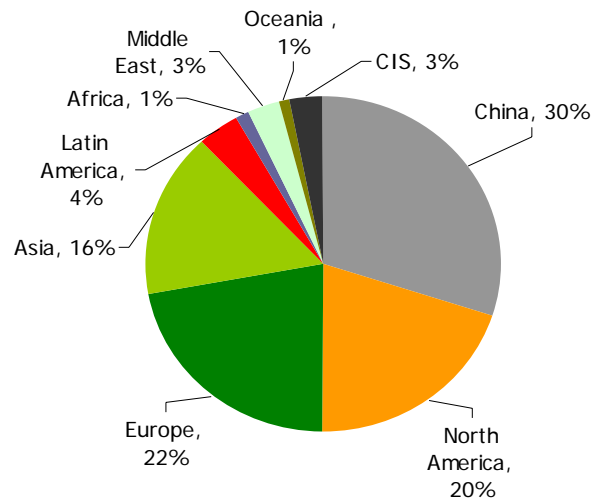


Source: Aluminium Leaders and NCB

2.3 Consumption and Production Balance

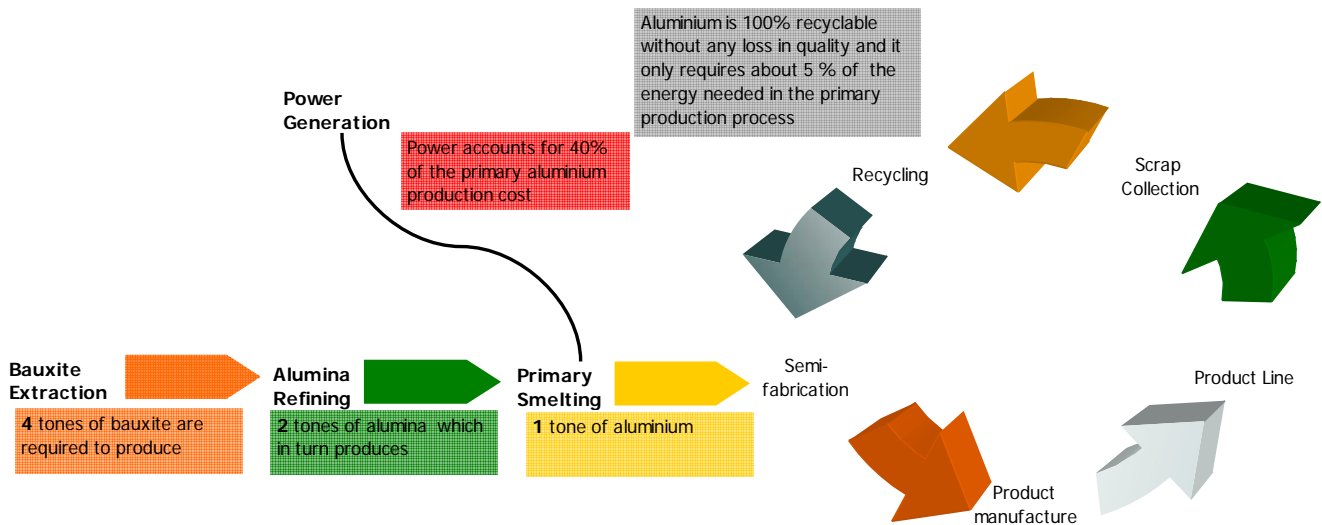
Global consumption has been growing at around 6% per year over the past decade. In 2007, worldwide consumption reached 37.8 mmtpa. The rise in demand is mainly driven by China's industrial development, which is accounting to one-third of total global consumption (Figure 4). Moreover, Chinese production and consumption continued to grow at accelerated rates over the past two decades. Between 1980 and 2006 China was able to expand its aluminium production capacity from 2% to 27% of global output (Figures 5 and 6).

Figure 4. Aluminium Consumption by Region, 2007



Source: MEED and NCB

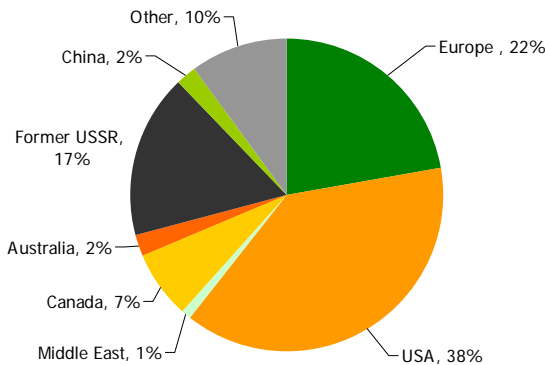
Figure 2. Aluminium Production Lifecycle



Source: MEED and NCB

Furthermore, prices of zinc, copper and steel, which act as substitutes for aluminium in electrical, power, transportation and construction applications are also surging.

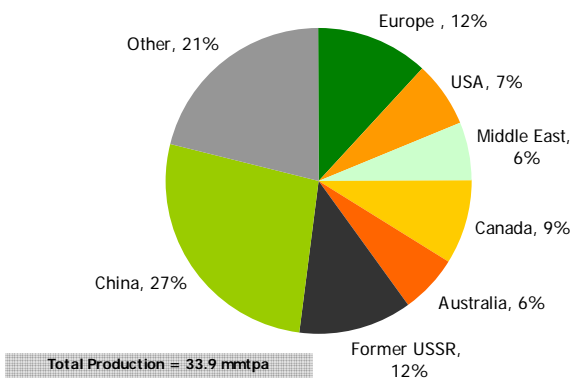
Figure 5. Aluminium Production by Region, 1980



Source: MEED and NCB

China's net exports of primary aluminium in 2006 were about 700,000 tonnes. However, given the country's growing needs for primary aluminium, and the surge in energy prices, we expect China to become a net importer of primary aluminium over the long-run.

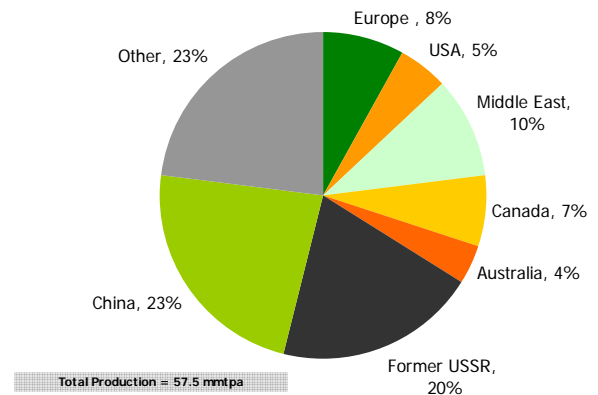
Figure 6. Aluminium Production by Region, 2006



Source: MEED and NCB

Figures 7 and 8 illustrate future aluminium market direction. During the 1980s, 60% of the aluminium manufacturing took place in Europe and the United States. In 2006, their market share dropped to 19%, and it is estimated to reach 13% by 2020. On the other hand, aluminium production capacity in energy-rich countries is actually increasing.

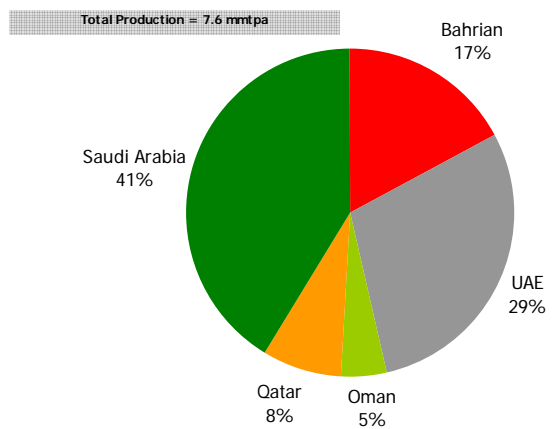
Figure 7. Aluminium Production by Region, 2020



Source: MEED and NCB

The GCC's share in primary aluminium production is increasing. It is expected that the GCC will control 10% of the world's market share by 2020.

Figure 8. GCC Aluminium Production, 2012



Source: Meed and NCB

2.4 International Aluminium Prices

Primary aluminium is traded on several metal exchanges, mainly the London Metal Exchange (LME). While high speculative trading in derivatives markets influences aluminium prices, causing short-to-medium price volatility, we believe that market fundamentals and the cost of production are the main determinants of long-term aluminium prices.

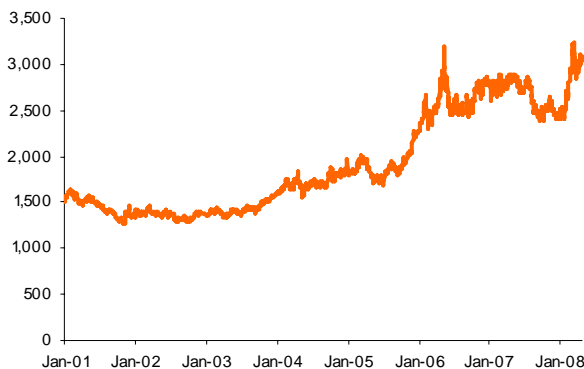
Markets, however, tend to lose touch with fundamentals during periods of robust demand. Historically speaking,

prices have been on a steady upward trend due to the rising cost of production caused by record high energy prices in key aluminium manufacturing countries.

As previously mentioned, high energy costs are prompting producers to relocate production facilities adjacent to major energy sources. Furthermore, the closure of aluminium smelters, whether temporary or permanent, located in regions most susceptible to high energy costs, will lead to significant capacity losses. New capacity additions will then be needed to partially offset the lost capacity and meet incremental global demand.

As such, we believe price pressures will be skewed to the upside over the long-term. It is only natural for the additional capacity to be supplied from energy-rich regions such as the Middle East, Russia, west Africa, and Asia.

Figure 9. LME Aluminium Prices , USD/tonne



Source: Reuters and NCB

3. Saudi Aluminium Sector

3.1 Business Environment

The Saudi aluminium sector is currently concentrated in downstream fabrication activities. It is based on the processing of various types of imported aluminium components, given that production of primary aluminium has not been established yet in the Kingdom due to the absence of aluminium smelters.

There are nearly 106 aluminium processing factories in the Kingdom, which supply the market with aluminium fixtures

for construction, kitchens, cooking utensils and other aluminium related products. With the exception of a few large companies, such as the Aluminium Products Company Limited (ALUPCO), the Saudi aluminium sector is highly fragmented, consisting of small fabricators. The feedstock for the final aluminium products sold by these factories is mainly semi-finished imported products.

ALUPCO is considered to be the largest player in the Kingdom, housing a productive capacity of more than 50,000 tonnes. The company's output is satisfying the bulk of local demand for extruded products, in addition to some regional and global markets.

The Kingdom, however, will soon become a major upstream player in the global aluminium industry. Upon completion, the five announced aluminium smelters will supply over 3.1 mmtpa of primary aluminium by the end of 2012, making the Kingdom a net exporter if not a global supplier of the metal.

3.2 Growth Determinants

Many factors are driving growth in the Saudi aluminium sector. Most importantly is government initiatives to rapidly expand the non-oil economy. The Kingdom has recently acknowledged its massive minerals resources, and has set goals to develop its minerals and mining sector to become the third pillar of the economy after hydrocarbons and petrochemicals.

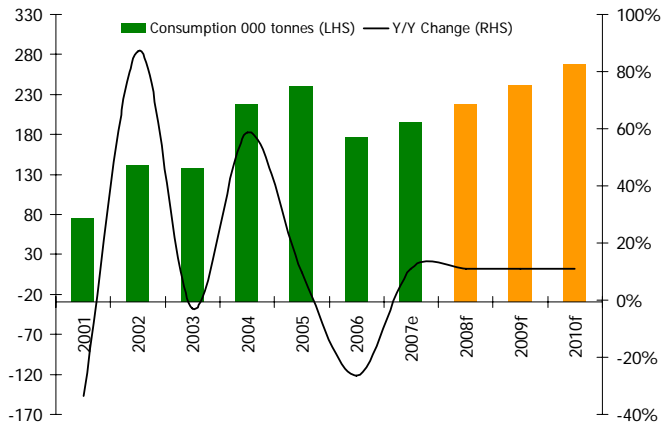
Second, surging local demand for aluminium and other building materials on the back of the Kingdom's construction boom. Third, the Kingdom is planning to emerge as a key global player in the international aluminium markets, given its comparative advantage of low cost energy producer.

Finally, Saudi Arabia is the only country in the GCC that has a proven reserve base of 126 million tonnes of bauxite with approximately 58% alumina in Al Zabirah mines. This will allow the development of a vertically integrated aluminium production site at Ras Az-Zwar, bringing the Kingdom's production costs below that of its GCC rivals.

3.3 Apparent Local Consumption

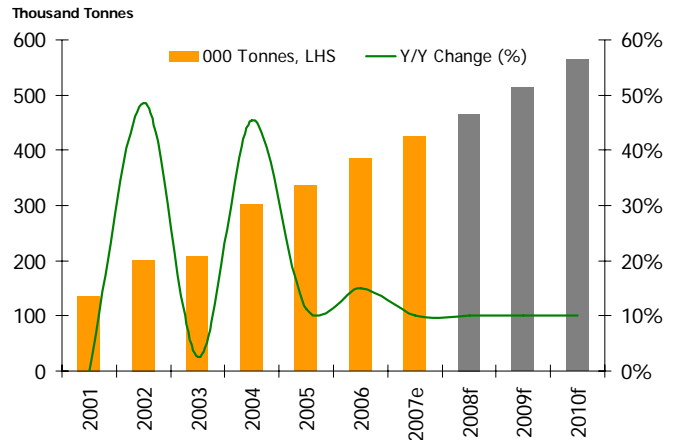
Import and export figures were used in determining apparent local consumption, based on the following general assumption, which assumes local production of semi aluminium at nil.

Figure 10. Apparent Local Consumption, 2001-2010



Source: CDS-Import Statistics and NCB

Figure 11. Saudi Aluminium Imports, 2001-2010



Sources: CDS-Import Statistics and NCB

Apparent Consumption = Imports – Exports

In terms of volume, total market consumption in 2007 was estimated at 195,624 tonnes with a growth rate of 11% as opposed to the significant decline of 27% witnessed the year before. The growth in aluminium consumption represents the demand for aluminum; which is mainly driven by the construction industry in the Kingdom. The chart above depicts an erratic incremental demand pattern over the past few years. Such volatility can be partially explained by; (1) the perpetual increase in the cost of imported aluminum, and (2) the build up of residual inventory from previous years.

The local aluminium market is currently valued at SAR5.5 billion. Domestic consumption is forecast to grow 37% by 2010, reaching 267,541 tonnes, and boosting sales to SAR6.8 billion by 2010 (Figure 10).

On a per capita basis, aluminium consumption has increased from 5.1 kg in 2000 to 7.4 kg per capita in 2006, which implies the need for more varied and innovative products in the Saudi market.

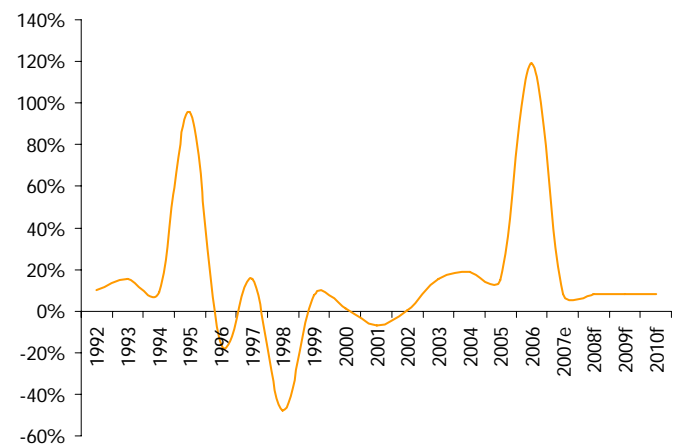
3.4 Imports

In 2006, Bahrain supplied 54% of Saudi 's aluminium imports. In addition to that, imports of all types of aluminum products rose 15% to 385,270 tonnes in 2006, while their value increased 14% to SAR3.7 billion during the same period. We believe that the volume of the imports will continue to grow at around 10% per year to reach 564,073 tonnes in 2010 (Figure 11).

3.5 Exports

Saudi exports of manufactured aluminum products totaled 578,589 tonnes worth some SR4.23 billions in the six year period to 2006, suggesting a yearly average of 96,431 tonnes. In addition, Saudi exports of aluminum products are estimated to have increased by 8% to 225,754 tonnes in 2007 compared to the year before, while its value rose by 3% to SR1.3 billion in the same period. As a result, the average export price has significantly dropped from SR9,402 per

Figure 12. Saudi Aluminium Exports Y/Y Growth, 1992-2010



Sources: MEED and NCB

tonne in 2005 to SR6,006 per tonne in 2006. However, over the last six years, the average export price for Saudi aluminium products was SR7,564 per tonne. The majority of exported aluminium products both in terms of quantity and value were household and kitchen fittings.

3.6 Government Regulations

The Saudi government is aiming to develop the mining and minerals sector to become the third pillar of the economy after oil and petrochemicals. According to SAGIA, at this time Saudi Arabia accommodates only 2% of the high energy industries. For that reason the government decided to utilize its comparative energy advantage and diversify its economy into energy-intensive industries, namely steel, aluminium, and fertilizer, through the development of the Economic Cities.

The government also reduced the tax liability from 30% to 20% for investors in the mineral sector, to attract foreign direct investments (FDI). It is also granting them the same treatment and rights as local investors.

3.7 Proposed Projects

The total value invested in primary aluminium production projects is USD17.1 billion (Table 1). As the Kingdom moves towards achieving its initiatives of economic diversification through the concept of Economic Zones, three out of the five announced aluminium smelting projects will be developed in an Economic City. The proposed projects are:

Saudi Arabia Emaar: EMAL (Emirates Aluminium) international, a JV between Mubadala Development Company and Dubai Aluminium Company (DUBAL), signed a memorandum of understanding with Emaar to build a smelter in King Abdullah Economic City (KAEC).

The aluminium smelter will have a production capacity of 700,000 tonnes in the first phase, with the potential to double its capacity.

Western Way for Industrial Development Company (WWIDC):

A consortium of private investors led by Saudi Binlandin Group (SBG) and Malaysia's MMC International Holdings Limited are promoting Jizan Economic City (JEC). This group was awarded a 30-year license to develop the Economic City. The same group is also planning to build an alumina refinery and an aluminium smelter at (JEC) with capacity of 1.6 mmtpa, and 700,000 mtpa respectively. The strategic geographical location of Jizan, with close access to the Red Sea as well as the Indian Ocean, will better enable WWIDC to market its products in Africa, Aisa, and Europe.

Sino Saudi Jizan Aluminium: This project is also led by WWIDC. A MOU was signed between MMC, SBG and Aluminium Corporation of China Limited (Chalco) to establish the second aluminium smelter at (JEC). An additional power plant will be developed by MMC to supply both smelters and other tenants at JEC.

Maaden: The JV between Maaden and Alcan plans to develop a vertically integrated "mines to metal" aluminium project at Ras AzZawr. The bauxite mines will be developed in Al Zabirah, which is believed to have around 126 millions tonnes of reserves that will yield an output of 3.5 mmtpa of bauxite ore with about 58% alumina.

An alumina refinery is planned at Ras Az-Zawr and will refine 1.4 mmtpa from the extracted bauxite. The aluminium smelter will also be built at Ras Az-Zawr and the alumina will be supplied from the near by alumina refinery. This backward integration will give Maaden an additional cost advantage compared with other regional competitors. Another benefit for Maaden is the agreement with the Royal commission for Jubail and Yanbu to share the development and usage of the railway from Al Jalamid to Riyadh, which will substantially reduce transportation cost and in turn the production cost base.

Table 1. Announced Aluminium Projects

Project Name	Location	Value Millions	Production Capacity	Expected Completion Date
Maaden	Al Zabirah	\$200	3.5 mmtpa of Bauxite	Q3 2011
	Ras Az Zawr	\$1,000	1.6 mmtpa of Alumina	Q4 2011
	Ras Az Zawr	\$3,700	0.7 mmtpa of Aluminium	Q4 2011
Sino Saudi Jizan Aluminium	Jizan Economic City	\$3,000	1 mmtpa of Aluminium	Q2 2012
Westrn Way of Industrial Development	Jizan Economic City	\$4,000	1.6 mmtpa of Alumina and 0.7mmtpa of Aluminium	Q4 2011
Saudi Arabia Emaar	King Abdullah Economic City	\$5,000	0.7 mmtpa of Aluminium	Q4 2012
Al-Zamil/ICF	Jubail Aluminium Fluoride Plant	\$150	50,000 tpa of Aluminium Fluoride	Q2 2010
Total		\$17,050		

Sources : MEED Projects and NCB

Al-Zamil/ICF: Al-Zamil Group and Industries Chimiques du Fluor (ICF) plan to set up a JV to establish an aluminium fluoride factory in Jubail. Aluminium fluoride is used to reduce energy consumption during the production of primary aluminium. This facility would be the first of its kind in the GCC and aims to providing supplies to regional producers. The feedstock for this product (aluminium hydroxide and fluorspar acid) will be imported, as it is not produced regionally. ICF is a global leader in the aluminium fluoride industry; it manufactures 45,000 tpa from its factory in Tunisia.

3.8 Impact of Oil Price Fluctuations

The production of primary aluminum is energy intensive; with energy accounting for roughly 40% of total production cost. Aluminium production costs are mostly impacted in net energy consuming countries, where oil and gas prices are market driven (supply/demand based), highly taxed and usually move in tandem.

In times of rising energy prices for instance, producers might decide to hold production temporarily or to close down production facilities. It is estimated that 2-4 mmtpa of the present high-cost aluminium production, mainly in the US and Europe, will shut down by 2010. In the Kingdom however, energy in general, is subsidized and regulated by the government, and therefore is not susceptible to oil price volatility.

We therefore do not foresee any impact of oil price fluctuations, over the short-term, on the local aluminium sector. Rising oil prices and ultimately aluminium production cost internationally will benefit local production, becoming more competitive. On the other hand, sustainable declines in oil prices would, however, have an adverse effect on the economy as a whole and in turn the sector. In addition, it will contribute to reducing production cost internationally, which may make Saudi production less competitive.

3.9 Exchange Rates Movement

Exchange rate movements have an in-direct impact on market value than volume. Although, Saudi Arabia mainly imports aluminium from Bahrain, the appreciation in other major currencies against the USD, and in turn the currencies pegged to it such as the Bahrain Dinar and the Saudi Riyal, will increase their raw materials import bill, which eventually will be passed on to the final consumers.

3.10 WTO Accession Implications

Kingdom's accession to the World Trade Organization (WTO) is expected to have a positive impact on the Saudi aluminium sector, in terms of capacity expansions, and the variety in downstream industries, specifically for the rapidly growing private sector. Under the WTO agreements; foreign operators are permitted to establish a mining or metals processing presence as a joint venture with a licensed Saudi entity. All newly established joint ventures will be granted national treatment clause, with no discrimination or restriction on repatriation of profit and capital.

3.11 Key Success Factors

The final aluminium product is a result of a lengthy production process that starts with mining and continues endlessly afterwards. As such, the key success factors for aluminium manufacturers mainly depend on which part of the production process they are involved in; upstream or downstream. Accordingly, we have identified the main elements of success for each of these areas:

Upstream (large-scale smelting projects):

- Competitive energy prices.
- Deploying state-of-the-art technology to boost efficiency, and reduce chemicals emissions.
- Adequacy of bauxite/alumina supplies. This can be achieved through; developing local mines, using term contracts to secure long-term alumina supplies, attaining equity interest in bauxite/alumina projects, or manufacturing companies worldwide.
- Defining the local and international downstream markets that will consume the primary aluminium produced.
- Securing adequate amounts of capital to facilitate the production process.

Downstream (flat-rolled aluminium):

- Adequacy of primary aluminium supplies to accommodate the development and expansion of rolling mills, extruders, and fabricators.
- Skilled labor. The advanced technical progress in the aluminium industry will require a skilled and highly edu-

cated work force. Training initiatives must take place to encourage the work force to specialize in metallurgy and other related fields.

- Recycling of waste and scrap collected from the production process or the market place requires approximately 5% of the energy needed in the primary production process. Aluminium is 100% recyclable without any loss in quality. According to the International Aluminium association, one third of the worlds aluminium products are made of scrap aluminium.
 - Diversifying downstream production portfolio will allow the local manufactures to enter new markets and increase their market share. Many industries worldwide are taking advantage of aluminium's many applications to enhance the quality of their products or cut their production costs. In Saudi Arabia, however, aluminium products uses are limited to construction, kitchens, and cooking utensils.
 - Using the latest technological developments enables materials engineers to generate various aluminium alloys that will enhance the end quality of the products and cater to the different customer needs.
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