World Aluminum

Industry Study with Forecasts for 2017 & 2022

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Table of Contents

EXECUTIVE SUMMARY

MARKET ENVIRONMENT
General ................................................. 4
World Population Outlook ......................... 4
World Economic Overview ......................... 6
Recent Historical Trends ............................ 6
World Economic Outlook ......................... 9
World Manufacturing Outlook .................... 12
World Building Construction Outlook .......... 14
World Motor Vehicle Outlook ..................... 16
World Packaging Industry Outlook ............. 19
World Food & Beverage Value Added Outlook .. 23
World Electric Power Generation Outlook ...... 26
Pricing Trends ........................................ 27
Aluminum Recycling ................................ 29
Competing Materials ............................... 30
Fuel Efficiency Standards ......................... 33

WORLD BAXIITE & ALUMINA SUPPLY
General ................................................. 35
Bauxite Reserves by Country ....................... 36
Bauxite Production by Country ................... 37
Alumina Production by Country .................. 40

WORLD ALUMINUM SUPPLY & DEMAND
General ................................................ 43
Demand by Region .................................. 44
Demand by Market .................................. 47
Construction ......................................... 48
Motor Vehicles ....................................... 50
Packaging .............................................. 53
Electric Power ........................................ 57
Other Markets ....................................... 59
World Aluminum Production by Region ........ 61
World Primary Aluminum Production Capacity .. 64
International Trade ................................. 65

NORTH AMERICA
General ................................................ 68
Aluminum Supply & Demand ....................... 69
Aluminum Demand by Market ..................... 70
United States ........................................ 72
Canada ............................................... 78
Mexico ................................................ 83

WESTERN EUROPE
General ................................................ 88
Aluminum Supply & Demand ....................... 89
Aluminum Demand by Market ..................... 91
France ................................................ 92
Germany .............................................. 97
Italy ................................................... 102
Spain ................................................... 107
United Kingdom .................................... 111
Other Western Europe ............................. 115

ASIA/PACIFIC
General ................................................ 120
Aluminum Supply & Demand ....................... 121
Aluminum Demand by Market ..................... 123
Australia ............................................. 125
China .................................................. 129
India .................................................... 136
Indonesia ............................................. 142
Japan .................................................... 147
South Korea ......................................... 151
Thailand ............................................... 156
Other Asia/Pacific ................................. 160

OTHER REGIONS
Central & South America ........................... 165
Aluminum Supply & Demand ....................... 166
Aluminum Demand by Market ..................... 167
Argentina ............................................. 169
Brazil ............................................... 172
Other Central & South America ................. 176
Eastern Europe .................................... 180
Aluminum Supply & Demand ....................... 181
Aluminum Demand by Market ..................... 182
Russia ............................................... 184
Other Eastern Europe .............................. 188
Africa/Mideast ...................................... 192
Aluminum Supply & Demand ....................... 193
Aluminum Demand by Market ..................... 194
Iran ................................................... 196
Turkey ............................................... 200
Other Africa/Mideast .............................. 204

INDUSTRY STRUCTURE
General ................................................ 210
Market Share ........................................ 211
Acquisitions & Divestitures ....................... 215
Cooperative Agreements ......................... 218
Manufacturing & Development .................. 227

COMPANY PROFILES
Alcoa Incorporated .................................. 229
Alumínio Brasileiro ................................. 237
Aluminium Bahrain ................................. 239
Aluminum Corporation of China ................. 240
Ball Corporation .................................... 244
BHP Billiton ......................................... 248
Century Aluminum ................................ 251
China Hongqiao .................................... 254
China Power Investment .......................... 256
Crown Holdings .................................... 258
Dubai Aluminum ..................................... 261
East Hope Group .................................... 263
Glencore International ............................. 264
Hangzhou Jinjiang Group ......................... 266
Hindalco Industries ................................. 267
JW Aluminum ....................................... 273
Kaiser Aluminum ................................... 274
Mubadala Development ............................ 276
Nanshan Group ..................................... 278
National Aluminum ................................ 280
Norsk Hydro .......................................... 282
Orkla ASA ............................................ 290
Rexam plc ............................................. 294
Rio Tinto Group .................................... 297
Shandong Xinfa Aluminum and Electricity ... 306
United Company RUSAL ......................... 309
Vale SA ............................................... 314
Vedanta Resources ................................. 316

List of Charts

MARKET ENVIRONMENT
World Aluminum Price, 2002-2012 ............. 29

WORLD BAXIITE & ALUMINA SUPPLY
World Alumina Production, 2012 ................. 42

WORLD ALUMINUM SUPPLY & DEMAND
World Aluminum Demand by Region, 2012 ..... 47

INDUSTRY STRUCTURE
World Primary Aluminum
Market Share, 2012 ................................ 213
# List of Tables

## EXECUTIVE SUMMARY
- 1 Summary Table ........................................ 3

## MARKET ENVIRONMENT
- World Population by Region ..................... 6
- World Gross Domestic Product by Region .... 6
- World Manufacturing Value Added by Region ... 14
- World Building Construction Spending by Region ..... 16
- World Motor Vehicle Production by Region ........ 19
- World Packaging Demand by Region .......... 23
- World Food & Beverage Manufacturing Value Added by Region ... 25
- World Electric Power Generation by Region .... 27

## WORLD BAUXITE & ALUMINA SUPPLY
- World Bauxite Reserves by Country, 2012 ......... 37
- World Bauxite Production by Country, 2002-2012 .... 40

## WORLD ALUMINUM SUPPLY & DEMAND
- World Primary Aluminum Supply & Demand .......... 70

## NORTH AMERICA
- United States: Aluminum Supply & Demand .......... 75
- Mexico: Aluminum Supply & Demand .......... 87

## ASIA/PACIFIC
- Asia/Pacific: Aluminum Supply & Demand .......... 123
- Australia: Aluminum Supply & Demand .......... 128

## WESTERN EUROPE
- Western Europe: Aluminum Demand by Market ........ 90
- France: Aluminum Supply & Demand .......... 95
- Germany: Aluminum Supply & Demand .......... 100

## OTHER REGIONS
- Central & South America: Aluminum Supply & Demand .......... 164
- Other Africa/Mideast: Aluminum Supply & Demand ........ 182

## INDUSTRY STRUCTURE
- World Primary Aluminum Production by Company, 2012 .......... 211
- Selected Acquisitions & Divestitures .......... 217
- Selected Cooperative Agreements .......... 220
Over half of additional world aluminum volume demand in 2017 will be accounted for by China, a significant producer that ran a large trade surplus of aluminum in 2012.

World demand to rise 5.8% annually through 2017

World demand for aluminum (primary and secondary/recycled) is projected to expand 5.8 percent per year through 2017 to 82.5 million metric tons. Over half of additional volume demand in 2017 will be accounted for by China. The country is also a significant aluminum producer and ran a large trade surplus of aluminum in 2012. In fact, China’s trade surplus and an associated global supply glut were largely to blame for recent drops in global aluminum prices.

Construction to remain largest market

Due primarily to the massive market in China, construction will remain the largest market for aluminum, with gains benefiting from a recovery in the housing sectors of a number of developed nations as well as rapid increases in construction spending in the developing world as a result of strong economic growth and urbanization. If excluding China, the motor vehicle market is the world’s largest user of aluminum. In most countries, motor vehicles account for a greater share of aluminum use than construction applications.

Growth in motor vehicle market to surpass average

Aluminum use in the motor vehicle market will see gains in excess of the overall market and will continue to benefit as car manufacturers strive to increase the fuel efficiency of their fleets by reducing the average weight of each vehicle. Aluminum is significantly lighter than steel, and aluminum use per motor vehicle is expected to rise through 2017.

Motor vehicle aluminum demand in developing countries will also benefit from the fact that current car ownership rates are low, leaving plenty of room for future growth. The world’s major motor vehicle manufacturers will continue to set up new plants in China, India, and other developing countries with booming motor vehicle markets, resulting in increasing sales of aluminum in those countries.

Packaging uses to benefit from convenience foods

Aluminum use in packaging will advance due to rapid proliferation of processed food and beverage products in developing countries. Healthy economic growth combined with the increasing presence of women in the workforce in these countries will result in a preference for convenience packaged food and beverage items. Aluminum cans’ popularity benefits from their excellent rates of recycling around the world. Intense competition from other materials such as plastics and glass in the packaging sector will prevent faster gains for aluminum demand.
Asia/Pacific

Construction will remain the largest market, despite posting below average (albeit still faster than the world average) gains through 2017. Between 2002 and 2012, construction related aluminum demand in China quadrupled in size. During that time the Chinese government was heavily investing in the local construction sector, and for much of the past decade China consistently accounted for at least one-half of global demand for construction related materials such as cement.

Aluminum windows are especially popular in China. Aluminum also finds significant use in doors, siding, and roofing in China to nowhere near an extent as in windows. China’s aluminum use in the nonbuilding construction sector is also very significant, with Chinese especially active in the construction of new high-speed railroads, air ports, and other infrastructure.

The motor vehicle market will post the fastest gains through 2017. The local motor vehicle industry will see output grow from 19.3 million units in 2012 to 28.0 million units in 2017. While in 2012 the average amount of aluminum used per vehicle produced in China was only 104 kilograms (well below levels in the developed world), it will rise to 119 kilograms in 2017. German manufacturers in China (especially German ones) are starting to produce newer models with a much greater aluminum content, and Chinese manufacturers are still lagging in that area largely due to limited experience.

Packaging related aluminum demand in China will also be growing, outpacing the overall local aluminum market. Healthy economic activity combined with the increasing presence of women in the workforce will result in a boost in sales of convenience packaged food and beverage products. In 2012, China produced an estimated 13 million beverage cans, well behind the US and Brazil in importance, suggesting significant growth potential. China is even less significant in aluminum foil demand.

<table>
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<tr>
<th>Item</th>
<th>2002</th>
<th>2007</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
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<tr>
<td>Motor Vehicle Production</td>
<td>265</td>
<td>850</td>
<td>2010</td>
<td>3320</td>
<td>5030</td>
</tr>
<tr>
<td>kg aluminum/vehicle</td>
<td>82</td>
<td>96</td>
<td>104</td>
<td>119</td>
<td>135</td>
</tr>
<tr>
<td>Building Construction</td>
<td>1940</td>
<td>4300</td>
<td>7700</td>
<td>11000</td>
<td>14800</td>
</tr>
<tr>
<td>metric tons alum/mil $</td>
<td>3.98</td>
<td>4.06</td>
<td>3.53</td>
<td>3.40</td>
<td>3.31</td>
</tr>
<tr>
<td>Food/Beverage Value Added</td>
<td>430</td>
<td>940</td>
<td>1600</td>
<td>2400</td>
<td>3400</td>
</tr>
<tr>
<td>metric tons aluminum/mil $ F&amp;B</td>
<td>4.23</td>
<td>4.39</td>
<td>4.48</td>
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<td></td>
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<tr>
<td>Electric Power Generation</td>
<td>1050</td>
<td>2130</td>
<td>3360</td>
<td>4500</td>
<td>5300</td>
</tr>
<tr>
<td>kgs aluminum/kWh electricity</td>
<td>640</td>
<td>649</td>
<td>680</td>
<td>688</td>
<td>693</td>
</tr>
</tbody>
</table>

China's aluminum demand by market (thousand metric tons)

<table>
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</table>
Vale is an international mining firm that mines iron ore, nickel, copper, coal, and other materials. The Company operates in five segments: Bulk Material, Base Metals, Fertilizers, Logistics, and Others.

The Company is active in the world aluminum and bauxite industry through the Base Metals segment, which had revenues of $7.1 billion and employed 55,070 in 2012. Among the segment’s operations are a 40 percent stake in a Paragominas, Brazil bauxite mine and a 40 percent stake in Mineração Rio do Norte SA (MRN), a Brazil based joint venture. The Paragominas mine had a bauxite production capacity of 9.9 million metric tons per year, as of 2012. In 2012, the mine produced 9.2 million metric tons of bauxite.

MRN is a joint venture that is 40 percent held by Vale; 14.8 percent owned by BHP Billiton Limited (Australia); 12 percent held by the Rio Tinto Alcan Incorporated subsidiary (Canada) of Rio Tinto Group (United Kingdom); 10 percent held by the Companhia Brasileira de Alumínio subsidiary of Votorantim Group (Brazil); 8.58 percent owned by Alcoa Alumínio SA (Brazil), a subsidiary of Alcoa Incorporated (US); 4.62 percent held by Alcoa World Alumina Brasil Limiteda, a subsidiary of Alcoa Incorporated (US).
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