



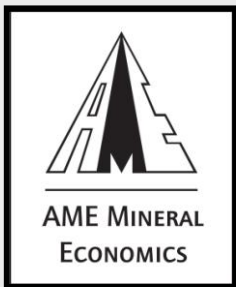
AME Mineral Economics

Aluminium & Alumina



The Sharp End of the Spear

**leading independent
commodity analysts in
metals, mining and minerals**



We are a leading independent research firm. For nearly 40 years we have served most major corporations active in the metals, mining and energy sectors.

The heart of our organisation is based around the talents of industry-experienced engineers, metallurgists, geologists, scientists, software developers, market experts, accountants and mineral economists with decades of experience, intellectual maturity and consulting expertise.

We offer

- *Independence* – Our perspective is based upon offering detailed material flow analysis from mines to consumers, including all the interlinked beneficiation and transport stages.
- *Asian knowledge* – Due to our long history in the region we offer an insight into the ASEAN countries and China - the engine of economic growth and metal demand. This is in contrast to the usual Northern Hemisphere view.
- *Maturity* – Since 1971 we have developed a huge history of people, companies, projects and acquisitions.
- *Critical mass* – We employ many skilled industry practitioners, have developed powerful databases and have an integrated global coverage.
- *Comprehensiveness* – We have specialist teams for LME metals research (such as copper, and nickel) and for steel raw materials, steel, and energy products.
- *Accuracy* – We are disciplined in capturing knowledge by undertaking site visits, attending industry conferences and meeting company management.

AME Direct

AME Direct is a secure and powerful delivery system. You can rapidly search and download just the analysis you need as opposed to pages of information.

AME Direct offers:

- *speed* – we utilise rapid packet technology.
- *ease of use* – filter tools that allow intuitive navigation.
- *interaction* – the **Cost Modeller** software encourages you to change key costing variables 'on the fly' and instantly observe the results. You can also merge datasheets to compare specific information over a number of industries and benchmark new projects.
- *timeliness* – our analysis and data is continually updated with new releases.
- *portability* – our research is stored on your PC and can also be retrieved off-line, as our research is stored after each visit to our site.
- *comprehensive coverage* – depending on the services you buy it covers most major industries from steel to gold from coal to copper.

comprehensive and accurate data collection from many sources

powerful systems detailed analysis

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Aluminium Production Cost Reports & Databases

Alumina and energy are the main contributors to aluminium production costs. Smelters with captive sources of alumina and access to cheaper energy will continue to dominate the lower region of the cost curve. This has prompted producers to place more emphasis on vertical integration and increasing levels of consolidation, as well as modernisations to improve production efficiency in the coming years.

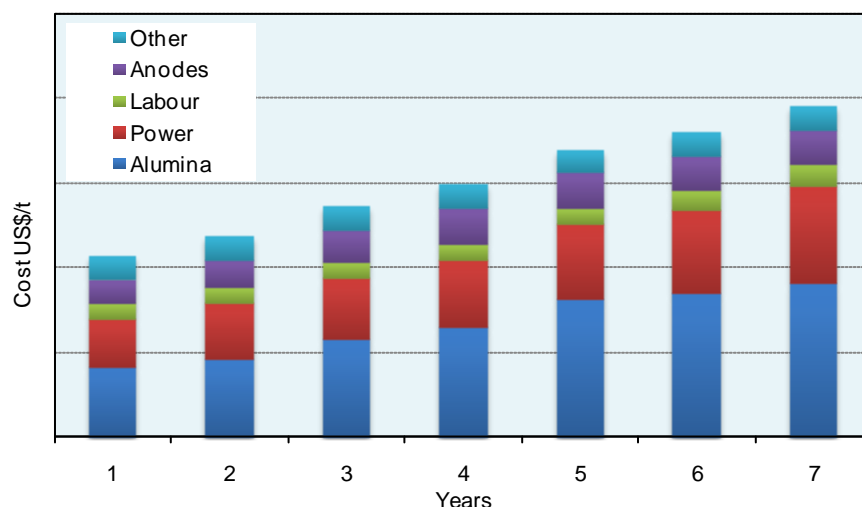
The primary drivers for higher long-term forecast metal prices are sustained higher capex costs across the production chain, from bauxite mine development through to refining and smelting, and higher operating costs. Lower energy consumption, longer cell life, lower raw materials consumption and meeting environmental regulations are critical drivers for improving and developing smelting technologies.

The aluminium industry is in the midst of an overhaul given the fluctuations of the aluminium spot price due to the turmoil of the GFC of 2009. Costs have been inflated for all inputs. While the prices of the key external inputs – alumina, electricity, labour and carbon (coke and pitch) – are the principal cost drivers, several internal technological factors are very important because they control labour and energy efficiencies. Operating expenditure is also significantly influenced by alumina quality, anode raw materials, country infrastructure, transport logistics, local equipment/machine suppliers and environmental legislation.

A broad industry thematic has been a lowering of the average cost of production due to the shutdown or idling of older, inefficient smelters in the United States and Europe. Modern, highly efficient plants will replace this capacity, often in localities that have an abundance of cheap energy, as preferential electricity supply contracts expire, especially in the West, and are re-negotiated at much higher rates. This will drive the migration of smelter capacity to countries such as India, the Middle East and Iceland. Low-cost gas, geothermal or hydroelectric power will be the driver of this trend.

Our Aluminium Smelter Cost Report covers operational data over a 10-year time span, representing more than 94% of world output. The multi-volume analysis estimates production costs in 37 countries, including many of the major facilities around the world. Cost estimates, covering the production process from raw materials consumption to either concentrate or finished metal are provided.

Aluminium Smelter Cash Cost Breakdown





Alumina Production Cost Reports & Databases

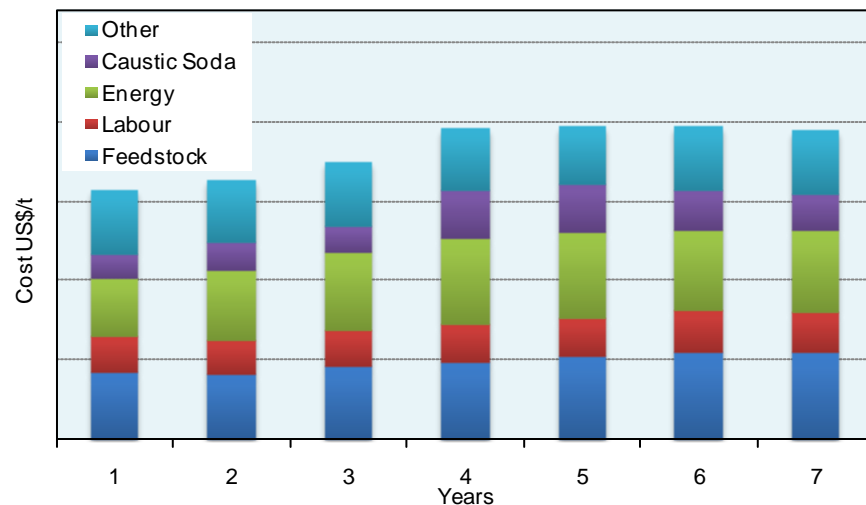
Bauxite and energy are the major contributors to alumina production costs. Refineries with captive mines nearby and access to cheaper energy will continue to dominate the lower region of the cost curve. On average, feedstock represents approximately 27% of industry cash costs. However, this contribution can vary widely for individual refineries, highlighting the advantage of access to low-cost bauxite supplies. The long-term trend is for certain costs (labour and energy) to fall with improving productivity and refinery efficiency, achieved through economies of scale, better management and minor technical advances. This effect has been sporadic in recent times due to the movements of major alumina-producing nations' currencies against the US dollar.

The crimping of demand witnessed during the GFC halted rising cost pressures and the cash cost of alumina production fell (in 2009) as expensive production facilities were curtailed. Nevertheless, AME estimates average global production costs remain higher now than those estimated for our base year of 2003. Prices of most cost inputs have risen sharply over this time, most notably for feedstock (>50%), energy (>85%), and caustic soda (>150%).

Bauxite price trends and negotiations continue to reflect the changed demand environment, and market conditions, particularly in China, remain tight. The precipitous decline in freight rates at the end of 2008 has lowered the cost of delivered bauxite for operations depending on imported feed, such as Shandong in China. This has also improved the competitive position of bauxite exporters.

Our Alumina Refinery Cost Report covers operational data over a 10-year time span, representing more than 90% of world output. The multi volume analysis estimates production costs in 22 countries, including many of the major facilities around the world. Cost estimates, covering the production process from raw materials consumption to either concentrate or finished metal are provided.

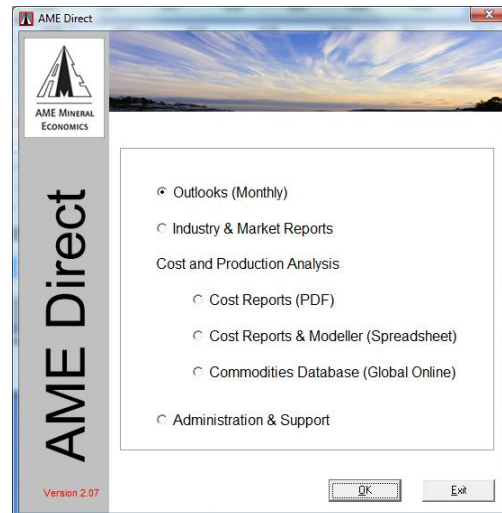
Alumina Refinery Cash Cost Breakdown



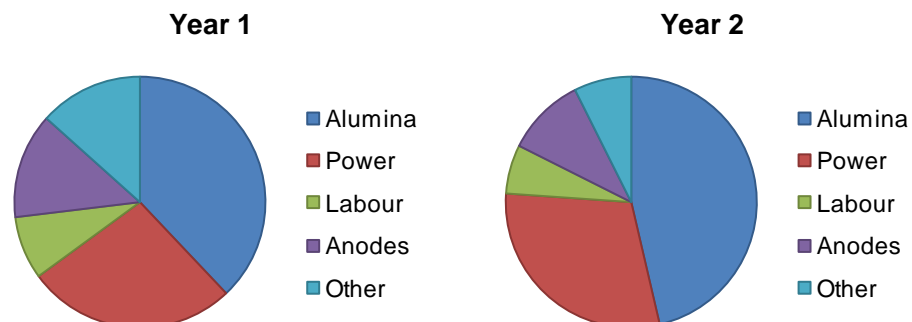


We benchmark all major operations to highlight changes, assess profitability and identify opportunities. This research provides:

- *Production and financial performance* over the next ten years with five years of history.
- *Detailed cost breakdowns* by project for up to 30 major components such as process technology, production, labour, energy usage, royalties and transport costs.
- Access to published reports and AME's Excel-based **Cost Modeller** via **AME Direct**, allowing users to change assumptions, analyse cost sensitivities, as well as introduce and compare new projects and operations:
 - Change operating cost, energy cost assumptions
 - Alter exchange rates for any producing country
 - Change freight rates
 - Override detailed cost assumptions for individual operations
 - Introduce new operations or projects



The database ensures access to accurate and timely information for most of the world's operations. Our analysts conduct thorough examinations of well-sourced data to provide valuable answers, saving you time and effort. Specifically, our work is based on detailed analysis of flow sheets, exhaustive company research, and ongoing revisions supplemented by mine visits and technical contact with individual operations.





Aluminium & Alumina Strategic Market Reports

Market fundamentals will be determined by the speed and size of the recovery from the global recession. The worst is over with multi-billion dollar stimulus packages appearing to have shored up end user demand, leading to a cautiously optimistic outlook. The orderly restart of smelters, given the still high levels of idled capacity and formidable inventory stockpiles, will be key in shaping the future aluminium price dynamic.

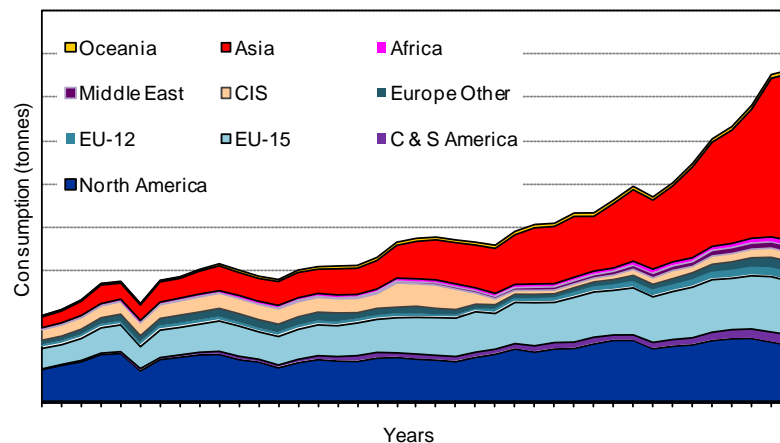
Continued urbanisation in Asia and progressive industrialisation in the wider developing world will underpin growth over the next decade. However, global growth will be at more modest levels in comparison to the last ten years. Thus spectacular growth at the height of the boom was driven by four principal factors, a combination unlikely to be replicated any time too soon:

- Enormous increase in the availability of credit to households and industry, driven by innovations such as securitisation of receivables, deregulation of the banking industry, credit insurance and increased acceptance of risk.
- The initial high growth rate of industrialization of greater Asia, and the consequent development of this region into the world's dominant manufacturing and metal powerhouse. The impact on the world was greater than any preceding Industrial Revolution.
- Tremendous productivity growth driven by an IT revolution which provided enormous communication, data flow and data storage capability at a fraction of previous historical costs.
- Huge growth in international trade that was by and large well managed by the World Trade Organisation. The compound growth rate of 5% has been unprecedented in recent economic history.

After a more subdued 2010 global GDP growth rates will rebound in the medium term but will be somewhat more modest at around 3% per annum over the long-term and below the rates experienced in the last five years.

The outlook for this year reflects the economic events of last year. Downturns in construction, automotive and electrical sectors chilled demand and an initially lethargic supply response allowed stocks to increase rapidly. Consequently, prices were depressed to well below the average cost of production for the bulk of the global industry.

Global Demand for Aluminium by Region





Low demand is expected to persist at least through this year. Supply reduction should accelerate as marginal high-cost producers are increasingly forced out of production. The prospects for aluminium consumption growth will be limited in the short-term. Over time, global fiscal stimulus, a return of consumer confidence in Western countries, continued infrastructure build and urbanisation in developing countries will see a recovery after 2010.

China has continued to increase its share of global aluminium demand to around 35%, and we expect this share to continue to increase out to 2013. Sustained cost pressures and more effective Chinese Central Government measures aimed at curbing over-capacity should lead to a significant easing in China's supply this year.

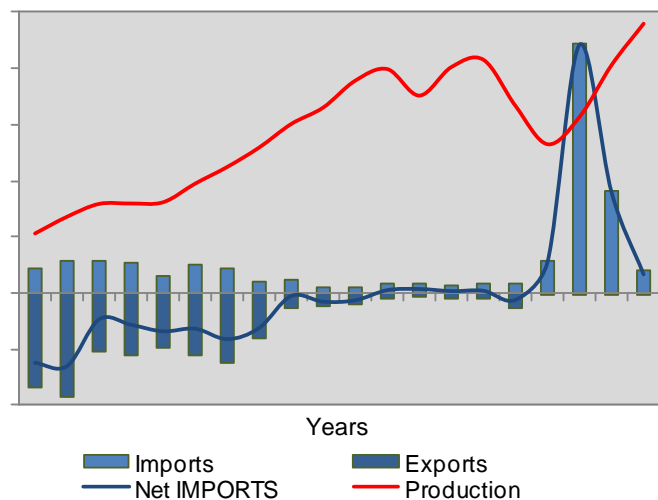
In the long term, competing demand for electricity will strain general power infrastructure and deliver higher power costs. The increases we have seen in energy costs to date will remain 'sticky' in real terms and cannot be regarded as a temporary abnormality. In China, the abolition of preferential power tariffs paints a grim future for outdated and inefficient technology. Penalties on "restricted" and "eliminated" categories above an already high industrial grid power rate will see China look to limit power resources to inefficient plants. For many Chinese smelters, even in buoyant times, the rate of financial return was small, and closure now may be permanent for some of them.

With over three decades of experience in market analysis, AME appreciates the old adage "the devil is in the detail" is a fundamental truth. To this end, we concentrate our investigation on end-users, particularly the construction, transport, equipment and consumer durable sectors.

We provide, usually quarterly, strategic supply/demand and price analysis to generate our long-term view. We offer:

- An innate understanding of raw material flow i.e. supply, which supports our project-by-project costing analysis.
- Comprehensive coverage of the entire global supply chain.
- Detailed end-use analysis, (transport, construction, consumer-durable sectors) as part of a coherent macro-economic demand view.
- Explanations of market dynamics and the implications for operations, companies and the industry.
- Support from our experienced team of industry analysts.
- Full electronic access through **AME Direct** as well as the printed reports.

China's Estimated Trade and Supply of Aluminium





Aluminium & Alumina Outlooks

Our monthly Outlook offers short-term analysis on developments, operations, consumption, production and trade and export in the Aluminium and Alumina Industries. A tactical, topical and thought-provoking tool; the service includes:

- Support from our analytical teams.
- Detailed supply/demand research offering company and country breakdowns.
- Forecast near-term prices and understanding of the market from a tactical perspective.
- Real insight on current topics such as the changing patterns in demand, industry consolidation or commentary on our latest studies.
- Great monetary value.
- Access to current and recent archived issues via **AME Direct**.

Consulting

We are frequently commissioned to provide:

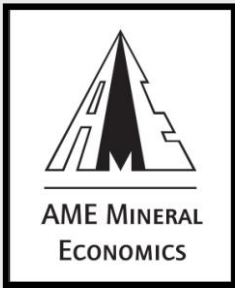
- Market assessments for debt information memorandums, feasibility studies and initial public offerings.
- Project audits and reviews involving both technical and market reports.
- Analysis of end-use markets for specific commodities.
- Cost benchmarking analysis for mines, smelters and refineries.
- Advice and independent assessments on trade sales or public equity issues.
- Strategic direction and focus for acquisitions.

Critical Mass in People and Resources – Our structured methodology allows us to rapidly undertake assignments and offer consistently rigorous work. This is possible as we employ a considerable team of engineers, geologists, metallurgists, economists, computer programmers and market experts. For nearly 40 years we have built widespread recognition among major mining companies, banks and trading houses, reflected in our increasing market share.

Close Industry Connections – Our analysts offer practical intelligence and advice due to years of experience in the mining industry. Consequently, our integrity and credibility is unrivalled when it comes to evaluations of mines, beneficiation projects and end-user plants.

A Comprehensive Global View – Our technical associations and international contacts allow us to provide you with broad, in-depth and forward-thinking research.





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