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About the Author - Ted Dickson

Ted Dickson has over 25 years experience in the industrial minerals industry. After obtaining a B.Sc degree in geology from Edinburgh University and an M.Sc in Mineral Exploration from the Royal School of Mines in London, he spent more than twelve years on the editorial staff of Industrial Minerals magazine, working at both the London and New York offices, latterly as American Editor. He then spent five years with a mining company, Cluff Resources, primarily assessing opportunities for the company to diversify into industrial minerals to supplement its gold mining activities.

For the past 13 years, Ted Dickson has been working as an independent consultant, running TAK Industrial Minerals, a consultancy that specialises in the markets for industrial minerals. While much of his work now involves dedicated consultancy reports for individual clients within the minerals sector, he continues to write various books, articles and multi-client studies on a range of industrial minerals-related subjects, including alumina and bauxite.

Market reports, book chapters and articles that Ted Dickson has authored or co-authored include:

- "Non-Metallurgical Alumina Supply". A paper presented at 11th Bauxite and Alumina Seminar, Miami, Florida, USA organised by Metal Bulletin/Industrial Minerals (February 2005)
- "Tabular Alumina and Activated Alumina". Chapters in "Bauxite & Alumina" Published by Industrial Minerals Information Ltd, London, UK (1999)
- "European Refractories Review: A Strategic Analysis" (with Alison Russell). A multi-client study published by Industrial Minerals Information Ltd, London, UK (2001)
- "Trends in Refractories for Modern Ceramics Production". A paper presented at CeramAsia 2002 Conference, Kuala Lumpur, Malaysia
- "Refractory Aluminas". A paper presented at the 17th Industrial Minerals International Congress, Barcelona, Spain (March 2004)
- "Fused Alumina Market". Single client market survey
- "High Alumina Calcines: Business Opportunities". Single client market survey
- "World Market for Tabular Alumina". Single client market survey
- "Alumina-based Refractories: World Markets". Single client market survey
- "Non-Metallurgical Markets for Alumina". Single client market survey

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The Non-Metallurgical Bauxite and Alumina Industry Worldwide

by Ted Dickson, TAK Industrial Minerals

ISBN 1 871677 49 1 (Published January 2006)

- Detailed information on production, consumption, imports and exports for non-metallurgical bauxite and alumina worldwide, including up-to-date statistical data presented in tables and in-depth analysis of the current and potential markets
- Full listing of metallurgical and non-metallurgical bauxite and alumina mines and refineries worldwide, including annual quantities mined and processed, and location of mines and plants
- Market status and production of non-metallurgical bauxite (raw and calcined) for refractories, abrasives, chemicals, cement, etc.
- Market status and production of non-metallurgical alumina (calcined, fused, tabular, high purity, chemical) for refractories, abrasives, chemicals, technical ceramics, catalysts, absorbents, etc.
- Review of aluminium hydroxide markets, including chemicals, flame retardants and other filler and additive end uses
- Analysis of growth areas for specialty aluminas, including calcined and activated aluminas
- Specifications of typical commercially available alumina and bauxite grades required by end-user industries
- Changes in geographic markets, in particular the situation in China
- Trends in prices, both current and predicted
- Technical developments in bauxite and alumina markets
- Review of companies and their activities in the industry, including plant/mine capacities, annual production levels, market position, product range, new projects, etc.
- Listing and contact details for companies, including postal address, telephone and fax numbers, e-mail and Internet addresses
- Over 100 tables of statistical data

Now available - "The Non-Metallurgical Bauxite and Alumina Industry Worldwide", a new market report that analyses the current position and future prospects for this important industry and its end-users worldwide.

Over 200 pages long and featuring over 100 tables of statistical data, this second edition of the report updates and greatly extends the information presented in the first edition (published in 1999).

Production and consumption of both bauxite and alumina have increased substantially since the previous edition of the report, largely driven by very strong growth in demand from China, although there has also been growth in other regions, albeit on a more modest scale.

Total production of bauxite reported by the US Geological Survey was 156 million tonnes in 2004, a 21% increase since 1999. More than 90% of the bauxite is for use in the production of alumina, with about 15 million tonnes used directly for non-metallurgical applications.

The non-metallurgical applications are primarily in refractories, abrasives, chemicals and cement (both as high alumina calcium aluminate cements and additions to Portland cement).

Of the 62-63 million tonnes of alumina produced in 2004, about 5.1 million tonnes was for non-metallurgical applications, representing approximately 8% of the total. Overall alumina production (metallurgical and non-metallurgical) has increased considerably in recent years, from about 49 million tonnes in 1999, an increase of about 28%. This indicates that a greater proportion of the increased bauxite production was for metallurgical grade alumina manufacture than for non-metallurgical applications, although differences in the grades produced can also cause variations.

Another important factor is that a considerable portion of bauxite production is captively held by alumina refiners and there may be a degree of under-reporting of bauxite output.

The current high demand for metallurgical grades of bauxite seems likely to put a strain on some supplies of non-metallurgical grades. The situation may ease because production of calcined bauxite in Guyana is being increased under a privatised company operated by Cambior of Canada.

Until the early 1980s, Guyana had been the main source of refractory and other grades of calcined bauxite, and with the restricted supply and rising prices for Chinese material, it looks set to regain some of its market share. There has also been some production from Brazil in recent years, but the operation was short lived, apparently due to limited reserves. Alternative supplies are being sought, and there have been suggestions of one yet-to-be announced project that will use pressurised shaft kilns for calcining rather than rotary kilns.

While in theory most alumina refineries can supply non-metallurgical grades of alumina, much of the supply comes from relatively few plants, some of which are primarily dedicated to production of non-metallurgical grades. Most of the specialty alumina producers no longer have dedicated Bayer alumina plants on-site.

(Continued overleaf)

(Continued from front page)

There has been considerable merger and acquisition activity in the alumina industry worldwide in recent years, and the structure of the industry has therefore changed significantly since the publication of the previous edition of the report. Alcoa has spun off much of its interest in non-metallurgical alumina, and its alumina chemicals division - renamed Almatix - was sold to Rhone Capital LLC. Alcan acquired Pechiney of France in a hostile acquisition completed in early 2003, having already closed its Burntisland plant in Scotland, its only European based non-metallurgical grade alumina operation. The equipment was sold to Bokstogorsk of Russia, which was already the world's largest producer of white fused alumina and was itself taken over by fellow Russian company Rusal in 2005.

Apart from this corporate restructuring, China has emerged as an enormous influence on this and many other industry sectors. The growth rates in industrial manufacturing being experienced in China are creating considerable demand for raw materials, including both bauxite and alumina. This has influenced world markets, and as a result supplies of bauxite and alumina, including specialty grades, are currently tight due to supply failing to adequately keep up with demand.

The two major consuming industries for non-metallurgical bauxite and alumina are refractories and abrasives.

The refractories industry's consumption of bauxite and alumina has been influenced by the overall trend towards higher priced products that have extended lifecycles rather than high volume products, and by changes in raw materials supply. The situation for the supply of refractory grade calcined bauxite has changed dramatically over the past 15 years or so, mainly because of Chinese exports. For most of this period, China's producers exported low priced grades, taking market share from Guyanese material. That situation is reversing now, with government controls and domestic demand from China's burgeoning industrial base restricting exports and causing rapid increases in prices beyond those that might be expected from recent high freight and fuel costs. Prices for refractory grade bauxite have essentially doubled in the last two years. Although no price increases were announced in the same period for Guyanese refractory bauxite, it is nonetheless expected that prices will rise.

In addition, increased production of steel in China of over 20% a year for the past four years is driving the rapid growth for refractory grades of both bauxite and alumina. In particular, there has been a trend toward the use of high alumina refractories.

In the abrasives industry, bauxite consumption is mainly as brown fused alumina, and considerable quantities of white fused alumina and calcined alumina are also used. Production of brown fused alumina is energy intensive and the proportion of production costs due to electricity consumption can be as high as 40% of the total. Because of this, the industry is sited in regions where cheap hydroelectricity is readily available, for example, in Norway, Brazil, Venezuela, and near Niagara Falls in Canada and the USA. Other consumers of bauxite include the cement industry, the oil industry (as proppants), and the chemical industry.

The other major non-metallurgical alumina grade is alumina trihydrate (ATH), which forms a base reactant and feedstock for chemicals such as aluminium sulphate, aluminium chlorides, aluminium fluoride and sodium aluminate. ATH is also used as a filler and additive, particularly in the field of flame retardants, which has been a strong growth area in recent years.

ATH, as used in chemicals applications, currently accounts for approximately 60% of non-metallurgical alumina demand. The remaining 40% is calcined for use in a number of industries but most importantly for the production of various refractories.

Prices across non-metallurgical bauxite and alumina grades have increased rapidly in recent years and are expected to remain high, although spot prices for alumina should decline in 2007-2008 as new supplies come on stream. However, it is predicted that prices will not fall to previous levels.

The report is over 200 pages in length and features over 100 tables of statistical data (see back page of this leaflet - a full list of tables is available on request). It is written by Ted Dickson, a minerals consultant with long-term specialist knowledge of the industry. He has prepared a number of studies on non-metallurgical bauxite and alumina markets, and given key papers on various aspects of the sector at conferences and meetings (see back page of this leaflet for further details).

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