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MetalBulletin Events

INDUSTRIAL MINERALS EVENTS

ALUMINA HYDRATE MARKETS

Issues & Trends

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Alumina hydrate supply

- What is the supply of alumina hydrate
  - ~200 million tonnes total
- Large percentage calcined to make alumina for aluminium production
- Essentially every Bayer alumina plant can supply
- In practice only some do
- Generally dependent on regional or local demand
- Alumina hydrate used for non-metallurgical applications
  - Of the order of 3.8 million tonnes Al2O3 content
  - Equivalent to about 5.85 million tonnes of gross weight

North American Supply Issues

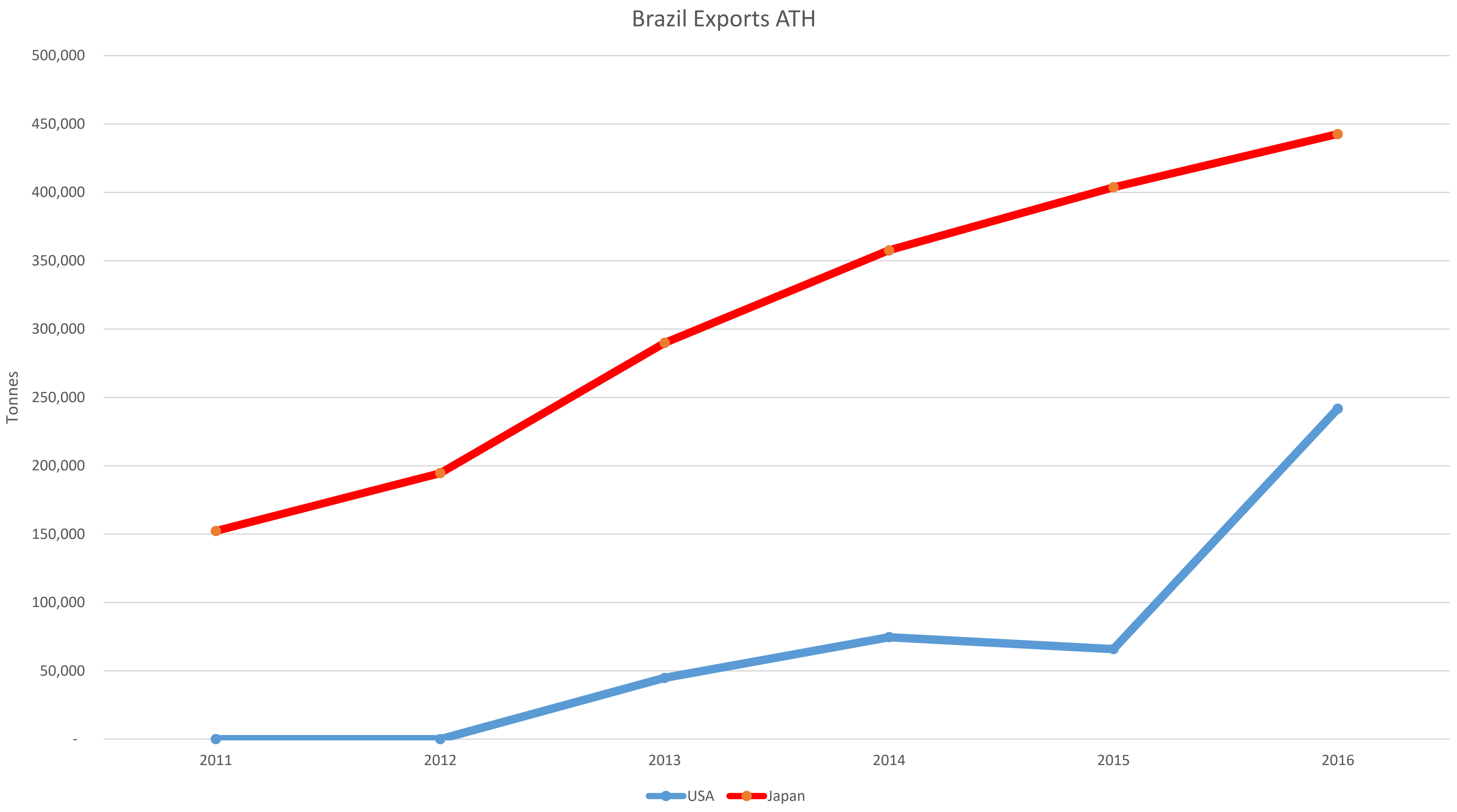
- Closure of Point Comfort and Corpus Christi plants in US caused short term supply issues
- Only Gramercy and Burnside in US and Vaudreille in Canada left
- Resulted in shortages of local material and need for increased imports
- Primarily from Brazil for North America
- Plus increased capacity and sales from Gramercy
- Particular shortages of dried material due to loss of drying capacity
- Market essentially back to balanced supply

Hydro prepares to reduce Alunorte production by 50%

While it is too early to determine the size and impact of the resolution, it could potentially have significant operational and financial consequences.

Trade patterns

- Trade tends to be regional rather than worldwide for standard grades of wet or dry hydrate
- There are significant shipments from Brazil to Japan and while Australia primarily exports to Japan and other Asian countries there are smaller quantities of dried product shipped to Europe if logistics are favourable
- Much more international for higher value grades notably flame retardant products
- Brazil exports to USA increased significantly after closures of US plants



Brazil Exports ATH
Tonnes
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
2011
2012
2013
2014
2015
2016
USA
Japan

Applications for ATH

- Water treatment chemicals
  - Aluminium Sulphate
  - Aluminum Chlorides
  - Sodium aluminate
- Aluminium Fluoride/synthetic cryolite
- Flame retardants/Fillers
- Zeolites
- Catalysts/Activated alumina

Market trends Water treatment chemicals

- Total ATH requirement at about 2.7 million tonnes representing about 1.75 million tonnes in Al_2O_3 content
- All in Europe and most in North America use wet hydrate but still some bauxite in USA and considerable amounts in India and China
- Markets mature in Europe, North America and other developed countries.
- About 10kg per head of population of all water treatment chemicals in developed countries 3-5kg elsewhere.
- Fragmented industry with few large international players
- Many small plants as chemicals delivery frequently in solution so logistics demand short hauls

Market trends Aluminum fluoride

- Almost all aluminium fluoride use in aluminium smelting
- Trends in usage directly related to world production of aluminium
- Does vary depending on process but 16-17kg/t aluminium average
  - Representing 17-18 kg ATH requirement
- Total requirement of ATH currently about 1.1 million tonnes
  - 715,000 tonnes Al2O3 content
- Producers a mix of fluorspar, alumina and phosphate fertiliser manufacturers (using fluosilicic acid as feedstock)
- Growth has been strong in last decade at over 5% CAGR driven by more than 10% per annum growth in China

Market trends Flame retardants

- Total demand for ATH in flame retardants of the order of 800-850,000 tonnes – 520-550,000 tonnes Al2O3 content
- Demand is growing at strong rate 3-6% depending on region
  - New regulation in Europe favouring non-halogen flame retardants
  - Nafta growth linked to automotive growth and general economy
  - Asia highest growth possibly even more than 6% but possibly slowing
  - Various drives from construction, automotive population growth etc
  - Regulatory requirements of exported products to EU and North America
  - Some slight slowing of growth linked to slower but still comparatively strong growth in Chinese economy

Market trends zeolite

- Significant declines in the use of zeolites in detergents
  - Move in Europe and North America to liquid/gel/concentrated detergents
- Total usage now <400,000 tonnes ATH (260,000 Al_2O_3)
- Replacement of zeolite in detergents in EU and North America mainly completed so more stable trend.
- Still important markets for zeolite in catalysts and adsorbents/dessicants
- Modest overall growth rates of 1-2% expected

Activated alumina

- Activated alumina used in variety of applications
- Total usage ~200,000 tonnes (130,000 tonnes Al_2O_3)
- Produced by partial calcination of ATH
- Dessicants for removal of water from liquid or gas streams
- Claus catalysts for removal of sulphur in the form of H_2S
- Water treatment
- Other absorbent applications
- Growth rates of potentially over 4% per annum especially in China and India

Other applications

- Titanium dioxide coatings
- Glass batch additive
- Specialty chemicals
- Some sold for third party calcining for specialty aluminas not included in the total estimated ATH

Pricing structure

- Wet hydrates tend to follow the prices of smelter grade alumina
  - Prices for contracts last quarter 2017 ~$230-260 per tonne ex works
  - About $370-400 in terms of alumina content
- Prices in terms of alumina content often slightly below those of smelter grade
- Dried ATH prices higher than smelter grades to reflect cost of drying
  - Approx $40 per tonne more than we hydrate on gross weight
- Specialty grades much higher in price
- White, ground hydrates from Bayer plants 2x to 3x the price of wet hydrate
- Fine precipitated grades even higher sometimes well over $1000 and as much as $2000 per tonne.
- Prices up 15-20% for contracts signed in last quarter 2017
  - Bayer plant cost up with increasing caustic soda prices
  - Smelter grade prices declined since then but contracts tended to be for a year

Outlook summary

- Water treatment markets slow growth with longer term high potential in developing economies
- Aluminium fluoride following aluminium trends perhaps slightly slower than total aluminium with improved efficiencies
- Zeolites modest growth expecially in non-detergent applications
- Flame retardants continued strong growth especially when new regulations introduced
- Activated alumina growth in a variety of applications – Claus catalysts dessicants and water treatment