Aluminium Market Outlook… trade rises to top of the agenda

Greg Wittbecker
Senior Consultant
CRU Group North America

AEC-San Diego March 16, 2018
CRU's reputation with customers across mining, metals and fertilizers is for integrity, reliability, independence and authority.

CRU's insights are built on a twin commitment to quality primary research and robust, transparent methodologies.

CRU invests in a global team of analysts, the key to gaining a real understanding of critical hard-to-reach markets such as China.

We strive to provide customers with the best service and closest contact – flexible, personal, responsive.

CRU – big enough to deliver, a high quality service, small enough to care about all our customers.
21 aluminium analysts…

… expanding in the US & Asia

Joined in 2018… Greg Wittbecker, formerly VP Analysis, Alcoa
Agenda

- Raw materials and impacts on aluminium smelting industry
- Aluminium market outlook
- End market drivers; construction, industry and automotive
- China macro trends to focus on
- Section 232 and impact
- LME and premiums forecast
- Conclusions
Recent production disruptions at Alunorte Brazil likely eliminates 2018 surplus and creates tightness in the Atlantic Basin.>> USA restarts would pull their alumina from!
2016, 2017 and 2018 business cost curves

2016 LME 3 month price: 1610/t
2017 LME 3 month price: 1980/t
2018 LME 3 month price: 2189/t
Agenda

- Raw materials and impacts on aluminium smelting industry
- Aluminium market outlook
- End market drivers; construction, industry and automotive
- China macro trends to focus on
- Section 232 and impact
- LME and premiums forecast
- Conclusions
Global aluminium market in modest deficit for 2018

The global aluminium market is now in balance considering the overall size of the market

Global aluminium market balance, million tonnes

Data: CRU
World excluding China in a large deficit

... but the market is now in a major deficit outside of China and that drives premium volatility

Aluminium market balance, million tonnes

Data: CRU
Chinese production growth has continued to climb

China production growth must now slowdown to avoid systemic surpluses

Aluminium production, million tonnes

Data: CRU
China inventory rising - the uncomfortable proof of surplus

Reported stock above 2.0Mt
[ˈ000t]

- Jiangsu
- Shanghai
- Nanhai
- Zhejiang
- Tianjin
- Henan
- Chongqing

Data: SHFE, CRU

Data: CRU
But stocks outside of China are falling rapidly

By the end of 2018, the financial crisis surplus will be gone

World excluding China inventories, million tonnes (LHS) as days of consumption (RHS)

Data: CRU, LME, IAI, CME
Agenda

Raw materials and impacts on aluminium smelting industry

Aluminium market outlook

End market drivers; construction, industry and automotive

China macro trends to focus on

Section 232 and impact

LME and premiums forecast

Conclusions
Broad improvement in global economic growth

- The leading indicators for global economic activity, and IP data, are positive at the start of 2018.

- **We forecast global IP growth of 3.5% in 2018** after 3.5% in 2017, emerging market growth will be stronger - we expect that during next year the faster growing economies in the developed world will hand-off momentum to the emerging economies.

- Whilst there is risk around this transition, **it is difficult to identify a catalyst for recession in 2018**. The economies of both Germany and the US, along with many others...seem immune to political turmoi!
China economy: Slowing investment and construction

- A breakdown of the GDP shows that the growth was driven by stronger net external trade, whereas **fixed asset investment (FAI)** slowed toward the end of 2017.
- Despite last year’s robust growth, we **expect GDP growth in 2018 to slow to 6.4%** due to several factors which will constrain domestic demand.
- **First, we expect investment spending to continue to decelerate** throughout 2018, given the government’s efforts to rein in capacity in heavy industry.
- **Second, a gradual slowdown in credit**, accompanied by tighter monetary and financial policies, will continue to **dampen activity in real estate sector**.
US economy: Construction firm, auto production stable

• There is clear momentum in spending for non-residential equipment as well as residential outlays. As such, we expect housing starts to rise to 1.3 M units in 2018, up from a lower-than-expected 1.2 M last year.

• We continue to expect GDP growth of 2.6% this year and maintain our 2019 forecast for slower growth of 2.0%. The prospect of a corporate tax cut spurred investment spending but the stimulus will fade after this year.

• IP growth was just 2.0% last year, we forecast IP growth of 2.4% in 2018. Total vehicle output is expected to be around 11.6 M units, on par with 2017 production levels.
Eurozone economy: Confidence still rising

- GDP expanded robustly by 2.7% y/y in Q4 2017, bringing annual growth to 2.5% last year, the highest rate since 2008.
- Housing demand, and subsequently residential investment, are expected to slow as the ECB starts to normalize monetary policy, which will push up mortgage rates.
- After a steady recovery from a low production level since 2009, as the benefits to demand of cheaper fuel fade, autos production in 2018 is set to stay flat at 2017’s level of about 14.3 M units.
- We forecast total IP growth of 2.5% this year, down from 2.9% posted in 2017.
Aluminium consumption: transport leads, construction lags

Global aluminium demand growth
Regional compound annual growth rate, 2016-2021

- Total world
- World ex. China
- India
- Middle East
- China
- North America
- Europe
- Japan

Global aluminium demand growth
End-use compound annual growth rate, 2016-2021

- Transport
- Machinery
- Electrical
- Cons. durables
- Packaging
- Foil stock
- Other
- Construction
Penetration of NA ABS primarily in closures and body

- **Roof**
  - 2016: 7%
  - 2025: 17%

- **Body**
  - 2016: 5%
  - 2025: 15%

- **Hoods**
  - 2016: 41%
  - 2025: 95%

- **Trunk**
  - 2016: 11%
  - 2025: 46%

- **Fender**
  - 2016: 8%
  - 2025: 25%

**Contents of aluminum sheet in automobiles**

- **lbs. per vehicle**
  - 2010: 40
  - 2012: 153
  - 2014: 250
  - **+63% between 2018-2015**

**Data:**

- Millennium
- 2025 Sales Forecast
- Compiled by CRU
Further boost in shift to electric vehicles, “mix” changes!

Aluminium content breakdown by product, ICE

- Rolled: 56%
- Extrusions: 19%
- Primary castings: 15%
- Secondary castings: 10%

Aluminium content breakdown by product, BEV

- Rolled: 36%
- Extrusions: 25%
- Primary castings: 19%
- Secondary castings: 20%
Agenda

- Raw materials and impacts on aluminium smelting industry
- Aluminium market outlook
- End market drivers; construction, industry and automotive
- China macro trends to focus on
- Section 232 and impact
- LME and premiums forecast
- Conclusions
China supply side reform finally getting serious

- 3 million tonnes per year of operational aluminium smelting capacity to close
  - 8% of output
  - Illegal
  - Privately owned
  - Permanent closure

- Chalco losses
- US WTO case
- US 232
- Central Govt.
- SOE Reform
- Financial market risk
- Export
- Pollution
- Hongqiao
- Northern Shandong
China production growth will be more deliberate

Chinese smelter expansions to add over 2.8Mt of production in 2019
Increase in Chinese production from major greenfield and brownfield projects, million tonnes

Special status projects will contribute the largest share of production growth in China
Growth in Chinese aluminium production from major projects, split by approval type, Mtpy

- Purchased replacement capacity
- Internal transfer
- Special status projects

Data: CRU

Major smelter ramp-ups expected in Guangxi and Inner Mongolia
Increase in annualised production by province, '000t

Guangxi
Inner Mongolia
Guizhou
Xinjiang

Data: CRU

Chinese smelter expansions to add over 2.8Mt of production in 2019
Increase in Chinese production from major greenfield and brownfield projects, million tonnes

Special status projects will contribute the largest share of production growth in China
Growth in Chinese aluminium production from major projects, split by approval type, Mtpy

- Purchased replacement capacity
- Internal transfer
- Special status projects

Data: CRU

Major smelter ramp-ups expected in Guangxi and Inner Mongolia
Increase in annualised production by province, '000t

Guangxi
Inner Mongolia
Guizhou
Xinjiang

Data: CRU
Environmental regulation in China IS getting tougher

• The Chinese government cannot ignore the environmental issues anymore. …the “environmental mortgage has gotten TOO BIG”
• It must continue fixing the problem as it has created expectations amongst its population of steady improvement
• The central government is doubling down on control
  ➢ Ministry of Environmental Protection (MEP) being changed to Ministry of Ecological Environment
  ➢ Assuming wider from over Land, Water and Agriculture Ministries= more central coordination of efforts
• Winter curtailment is expected to be continued next winter. The Henan provincial government issued the plan for next winter already
• Aluminium smelters in 2+26 cities have been asked to meet higher emission standards in March;
• Greenhouse gas trading scheme has been created by the end of 2017, but real transaction will be seen in 2020;
• Illegal capacity control will remain tight, all of new capacity have to purchase capacity quota first; *by end of 2018, illegal capacity either has to acquire operating rights or it can not return to production…time is running out to find willing sellers
Chinese aluminium demand growth slowing

Chinese consumption growth is slowing but rising demand growth outside of China

Year on year change in aluminium consumption

Data: CRU
China **primary** demand consumption is slowing

- CRU forecasts 2018 Chinese primary aluminium will be 36.5Mt in 2018, up 5.4% y/y. Quarterly growth y/y has slowed compared to that of 2017, indicating a softening market. There will be a seasonal drop in Q1 2018, as small downstream plants shut down and larger plants curtail operations.

- **Construction and transport sectors will continue to drive demand growth.** New applications such as pedestrian bridges, bus stations, aluminium formwork and aluminium furniture will be an additional source of growth. **More than 60 aluminium made pedestrian bridges have been installed in China as of December 2017.** Also, we estimate 15% of formwork is now made of aluminium.

- **China remains far behind the ROW in terms of efficient scrap utilization in its aluminium downstream operations**
  - This will change as Beijing places more emphasis on carbon trading
  - Practically speaking, downstream in China can’t compete making FRP and Extrusions out of nearly 100% primary metal
Transport sector key to offset for slower construction

Construction growth in infrastructure and residential development slowing…even “hukou reform”…which promises legal rights to 250m disenfranchised migrants in Tier 1 cities may not be enough to sustain residential growth

Aluminium demand rising in 2018 at a slower pace
[million tonnes]

Construction growth to slow down in 2018

Data: CRU

Data: NBS. CRU
Trade actions are a wakeup call to China’s ability to export

*China has operated with a premise that it had unbridled access to ROW demand to export its surplus capacity….NOW for the first time, that assumption is being challenged*

**China FRP export up 25%**

**Chinese foil to US down**

**Chinese foil to India up in Q4**

---

Data: CRU

Data: IHS

Data: IHS
One Belt One Road (OBOR) is China’s next export plan

• $150 billion/year being spend in 68 countries currently part of the scheme
• May total upward of $5 TRILLION dollars over the life the Plan
• Involves countries with 62% of global population and 30% of its GDP
• Multiple motives:
  ✓ Investing in foreign infrastructure providing a profitable home for China’s massive foreign exchange reserves vs investing in US securities
  ✓ Providing economic stability in adjacent Central Asia creating insulation against unrest spreading back into China (example….Tibet and Xinjiang)
  ✓ Broadens political influence
  ✓ Creates external demand for China’s massive excess capacity in core industries

• Within the aluminum sector we see examples of this increasing:
  ➢ Bauxite mine development in Guinea
  ➢ Alumina refineries in Indonesia and Vietnam
  ➢ Aluminum smelter technology and ventures in India, Iran, and Malaysia
  ➢ Attempted acquisitions of rolling capacity in the USA
  ➢ Purchases of LME warehousing capacity and LME dealing members
trade wars are good, and easy to win

Our Steel and Aluminum industries (and many others) have been decimated by decades of unfair trade and bad policy with countries from around the world. We must not let our country, companies and workers be taken advantage of any longer. We want free, fair and SMART TRADE!

4:12 AM - 1 Mar 2018
Why? As US smelters have closed down...

Aluminum capacity, million tonnes per year, and number of operational smelters
Chinese exports to the world have surged

Chinese exports up 14-fold since 2000 when China emerged as a player

Chinese aluminium exports, million tonnes
The practical effects of Section 232 on US prices

- **US remains an net importer of metal units**, the imposition of the tariff simply raises the clearing physical premium for the imported metal required.

- Producers exempt from the tariff **earn the incremental clearing premium** as revenue.

- Domestic restarts should be incentivized by the tariff but the timing may be slower.

- Producers **NOT exempt from the tariff are revenue neutral** as the tariff becomes a cost of doing business and they are not earning any more or less as a result of this...hence no effect on their production decisions.

- Inventory liquidation could delay but not halt premium appreciation.

- **Scrap substitution** through higher imports and domestic recycling could also help but can’t fully displace the more expensive cost seaborne primary supply.

- Billet upcharge indexed to Midwest could see some appreciation as domestic duty paid capacity may not be adequate to replace seaborne imports subject to duty.
Delays on power & tariff execution could scupper any restart

US smelting capacity and production
2017 annual output and capacity in 000 MT

935,000 of capacity presently idle in the USA

Warrick restarted 161,000tpy in Q1 2018

Data: CRU

New Madrid
Warrick
Wenatchee
Hawesville
Mount Holly
Ferndale
Sebree
Massena West

annual output
idle capacity
Bottom up construction of the import clearing premium

USA premium expressed in cents/lb

Duty presents 50% of total

CIF USA Duty Unpaid: 7
10% Ad Valorem Duty: 10.25
Discharge Costs: .75
Interior Freight: 2.25
Finance: .25
Dlvd. Midwest Duty Paid: 20.75

1/ LME cash $2,112.50 + $154 CIF premium x 10%
Agenda

- Raw materials and impacts on aluminium smelting industry
- Aluminium market outlook
- End market drivers; construction, industry and automotive
- China macro trends to focus on
- Section 232 and impact
- LME and premiums forecast
- Conclusions
Prices to stabilise in 2018

LME 3-month price forecast

$/t

High Case
Forward curve, February 21, 2018
Low Case
Base case

Data: CRU, LME
... But with smelter utilisation rates rising...

Smelter utilisation outside of China to exceed 90% by 2020

Data: CRU
Growing investment need will keep prices higher long term

Additional smelting investments needed before 2020
Primary aluminium investment capacity requirement, million tonnes per year

Data: CRU
US Midwest premium already pricing in the duty

US Midwest premium ¢/lb

Data: CRU, CME
Longer term premiums stay high, duration of duty is key!

US Midwest premium will jump if duties are confirmed
US aluminium premium, ¢/lb

Data: CRU
Conclusions

Large market deficits outside China

China in surplus but supply reforms are getting serious

Demand ex China is good, but China is slowing

China’s access to ROW markets is being seriously challenged

LME prices and premiums may remain high to encourage more investment and to price the cost of seaborne imports to the US market
Doug Hilderhoff
Doug.hilderhoff@crugroup.com
724-759-7872

Mike Southwood
Mike.Southwood@crugroup.com
724-759-7868

Greg Wittbecker
Gregory.wittbecker@crugroup.com
865-621-4564
## CRU Product Offerings

<table>
<thead>
<tr>
<th>SEGMENT</th>
<th>PRODUCT</th>
<th>TYPE</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAW MATERIALS</td>
<td>Bauxite and Alumina Monitor</td>
<td>Monitor</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Bauxite and Alumina Monitor Weekly Update</td>
<td>Monitor</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Bauxite and Alumina Market Outlook</td>
<td>Market Outlook</td>
<td>Quarterly</td>
</tr>
<tr>
<td></td>
<td>Bauxite and Alumina Market Outlook Exec. Summary</td>
<td>Executive Summary</td>
<td>Quarterly</td>
</tr>
<tr>
<td></td>
<td>Bauxite and Alumina Long Term Market Outlook</td>
<td>Market Outlook</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Alumina Cost Curve</td>
<td>Cost Curve</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Bauxite Mining Cost Curve</td>
<td>Cost Curve</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Bauxite and Alumina Cost Model</td>
<td>Cost Model</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Alumina Cost Report and Profiles</td>
<td>Cost Report</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Bauxite Cost Report and Profiles</td>
<td>Cost Report</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Carbon Products Monitor</td>
<td>Monitor</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Carbon Products Market Outlook</td>
<td>Market Outlook</td>
<td>Yearly</td>
</tr>
<tr>
<td>PRIMARY</td>
<td>Aluminum Monitor</td>
<td>Monitor</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Monitor Weekly Update</td>
<td>Monitor</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Aluminum China Fortnightly</td>
<td>Monitor</td>
<td>Fortnightly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Market Outlook</td>
<td>Market Outlook</td>
<td>Quarterly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Market Outlook Exec. Summary</td>
<td>Executive Summary</td>
<td>Quarterly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Long Term Market Outlook</td>
<td>Market Outlook</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Casthouse Shapes Market Outlook</td>
<td>Market Outlook</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Cost Curve</td>
<td>Cost Curve</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Aluminum Cost Model</td>
<td>Cost Model</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Cost Report and Profiles</td>
<td>Cost Report</td>
<td>Yearly</td>
</tr>
<tr>
<td>DOWNSTREAM</td>
<td>Aluminum Products Monitor</td>
<td>Monitor</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Rolled Products Market Outlook</td>
<td>Market Outlook</td>
<td>Quarterly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Rolled Products Market Outlook Exec. Summary</td>
<td>Executive Summary</td>
<td>Quarterly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Auto Body Sheet Market Outlook</td>
<td>Market Outlook</td>
<td>One-off</td>
</tr>
<tr>
<td></td>
<td>Aluminum Can Stock Market Outlook</td>
<td>Market Outlook</td>
<td>One-off</td>
</tr>
<tr>
<td></td>
<td>Aluminum Rolling Cost Model</td>
<td>Cost Model</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>Aluminum Rolling Cost Report and Profiles</td>
<td>Cost Report</td>
<td>Yearly</td>
</tr>
</tbody>
</table>