Merchant Anodes: How Quality Can Save Millions
Today’s Conversation

- Introduction to Aminco Anodes
- The merchant anode industry
- Evolution of producers and consumers
- Current state of the market
- Industry adjustment is needed
- Our vision for the future
- Aminco Anodes’ contribution
AMINCO in partnership with R&D Carbon are the leading producer of guaranteed quality, cost-effective and energy-efficient carbon anodes.

AMINCO Anodes provide the most advantageous cost benefit ratio in the industry.
AMINCO Anodes Highlights

- **1994** Enters the merchant anode market
  - Initial sales to CIS market
- **1997** Forms partnership with R&D Carbon
  - Production agreements with carbon plants in China
  - Swiss Quality Anodes Made in China™
- **1998** Swiss Made in China first exports from China
  - Deliveries to Asia, US and Europe
- **2001** Aminco anode quality surpasses in house production
  - Smelter closes its own anode production
- **2013** Exports 2 millionth ton of anodes from China
- **2016** The drive for 3 million tons......
**Evolution of The Merchant Anode Producer**

**1990’s**
- ALUCHEMIE - the dominant merchant anode producer has 90% market share
  - Competition mainly from S. America and later Egypt
  - China enters export market: anode capacity - 500,000 MTA, but low quality

**2000’s**
- ALUCHEMIE no longer the “only” anode supplier
- Chinese anode quality begins to improve and capacity grows to 5 million MTA
- Western anode producers exit the business

**2010’s**
- Chinese anode quality stabilizes and anode capacity tops 9 million MTA
- China exports 1 – 1.5 million TPY – replaces all western merchant production
- **Market competes on price not quality**
Evolution of The Merchant Anode Consumer

- **Phase One:** The traditional merchant anode consumer
  - Smelters supported by a centralized anode plant

- **Phase Two:** A new consumer base develops
  - Smelters shut down internal carbon plants and outsource
  - Smelters expand/convert potlines without expanding anode capacity:
  - Smelters reborn without carbon

- **Phase Three:** The market evolves again;
  - Greenfield smelters without internal carbon
  - Internal plants unable to meet smelter demand, due to
    - Smelter capacity creep
    - Lack of investment in house carbon facilities
What is the Relative Health of the Industry - 2016

The Good

- Anode plants operating at 90+% of capacity
- “Tea Pot” refineries producing more anode grade coke
- The major western anode customers are 100% reliant on Chinese merchants: 5 producers account for 85% of exports
- RMB devaluation supports exports

The Bad

- The ratio of anode plants to aluminum smelters favors the customer!
- Two major coke suppliers – sets the market
- Export anode customers decreasing: Pockets of demand growth will not offset permanent western smelter closures
- Environmental regulations - more severe and demanding
- Payment issues from Chinese smelters
What is relative health of the industry - 2016

The Unknown

- The aluminum production growth curve in China
- Green coke import and production regulations – how policy changes will impact anode production
- RMB devaluation how long will it continue
- “Uber” Anode competition
Anodes: A key and controllable variable

Why Quality Matters!

- Power prices
- Alumina
- LME
- Anodes in the pot

Jacobs Consultancy
Carbon’s Vicious Cycle Costs Millions!

- **DUSTING**
- Higher bath resistivity
- **ACD squeeze**
- High noise level
- **Loss of CE**
- Higher bath temperature

Graphs and images illustrating the cycle.
## Smelter Profitability Increase with Consistent High Anode Quality

600,000 MTA smelter with performance anodes can achieve

- **Pushing amperage > Al production +10%**
  - $30 M pa

- **Energy per ton of Al < 0.5 MWh/t Al**
  - $6 M pa

- **Current efficiency > 1%**
  - $8 M pa

**Total:** $44 M pa

340’000 tpa high quality anodes are essential
Break even: $120.00 per MT of Anode
Here is What Losing Money Looks Like …..
Versus the Look of Making Money
Our Vision for the Future

- Existing anode plants should consider
  - Merging with existing smelters and/or consolidating
  - Improve environmental control/worker safety and hygiene

- Anode plants must compete on quality and innovation and not only on pricing!
  - There is no place in the market for anodes which reduce smelter performance!
  - The progressive consumer will improve profitability by using a higher quality anode

- Anode Price is based on cost per ton of aluminum produced
### AMINCO ANODES/ R&D Carbon

**Our calculation**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>✔️</td>
<td>Selection of raw materials for anode production</td>
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<tr>
<td>✔️</td>
<td>On site supervision of anode production</td>
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<tr>
<td>✔️</td>
<td>Prior to shipment, quality control performed at R&amp;D Carbon</td>
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<tr>
<td>✔️</td>
<td>Just in time delivery</td>
</tr>
<tr>
<td>✔️</td>
<td>Supervision of anode behavior in smelters</td>
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<tr>
<td>✔️</td>
<td>Butts return if required</td>
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*AMINCO ANODES\*  
*SWISS QUALITY MADE IN CHINA*
A Valuable Source of High-Quality Carbon Anodes

A world class carbon supply with R&D Carbon inside