

Merchant Anodes: How Quality Can Save Millions



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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 Anodes

Swiss Quality Made in China



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

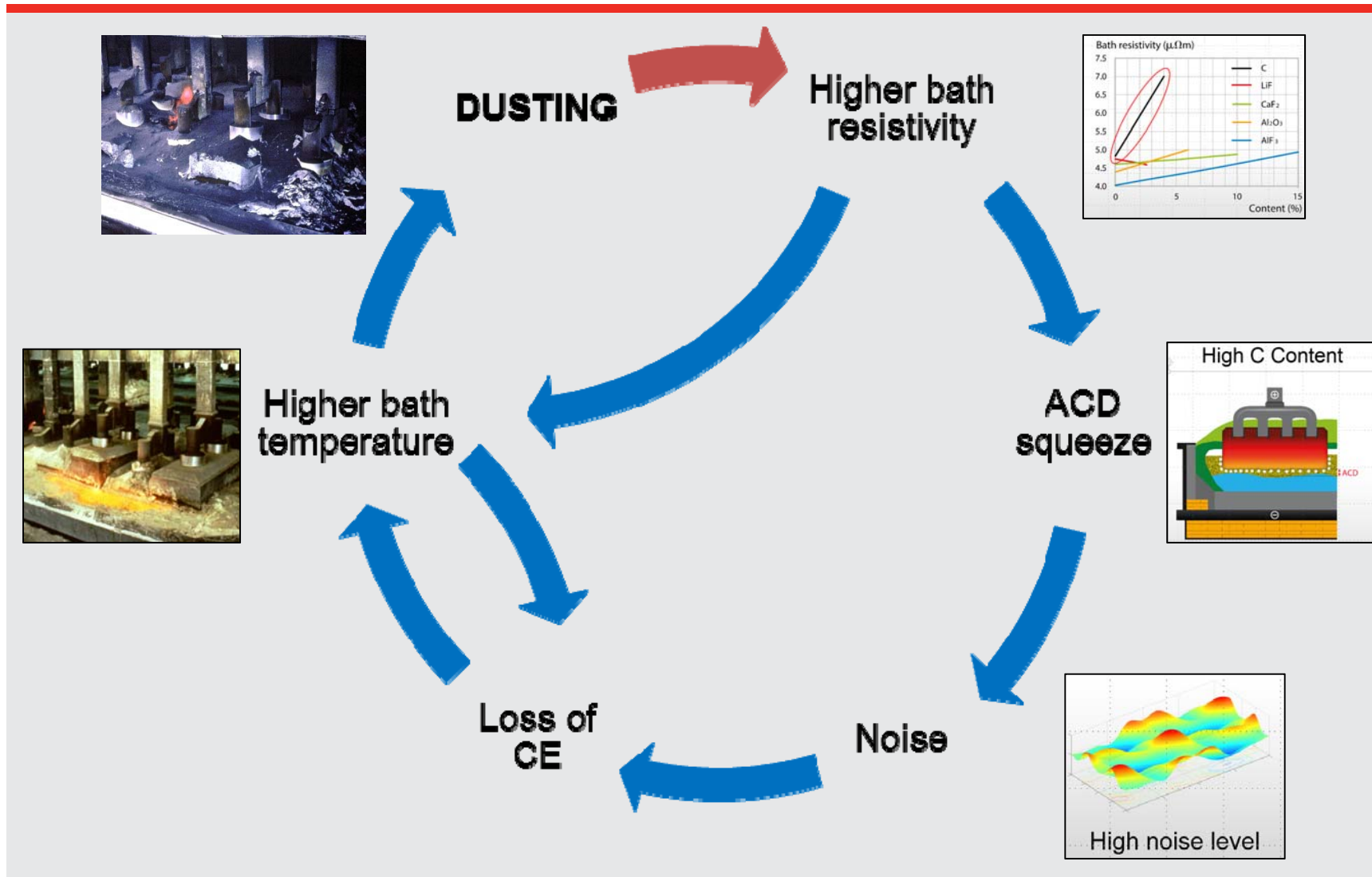
- The ratio of anode plants to aluminum smelters favors the customer!
- Two major coke suppliers – sets the market
- Export anode customers decreasing: Pockets of demand growth will not offset permanent western smelter closures
- Environmental regulations - more severe and demanding
- Payment issues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

Carbon's Vicious Cycle Costs Millions!



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 |
| | <hr/> \$ 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

	Selection of raw materials for anode production
+	On site supervision of anode production
+	Prior to shipment, quality control performed at R&D Carbon
+	Just in time delivery
+	Supervision of anode behavior in smelters
+	Butts return if required
=	 <p>AMINCO ANODES SWISS QUALITY MADE IN CHINA</p>

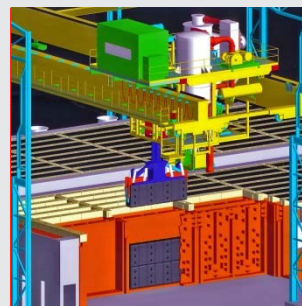
A Valuable Source of High-Quality Carbon Anodes



Raw Materials



Quality Control



Manufacturing



Logistics/Finance



A world class carbon supply with R&D Carbon inside