



Crude quality impact on the aluminum industry

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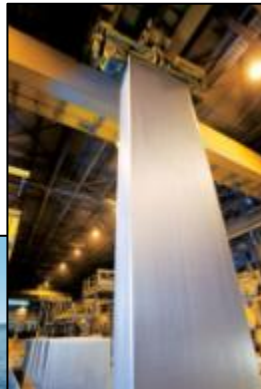
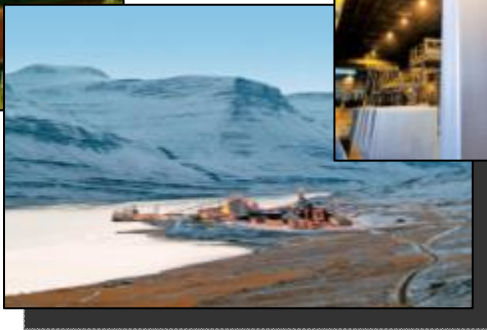
Agenda

- Alcoa overview
- Calcined coke in aluminum smelting
- Closing comments



Alcoa at a glance

- Founded in 1888
- 200+ locations
- 31 countries; 61,000 employees
- \$25.0 billion in revenues (2011)
- Lost workday injury rate 1/10 that of the avg. U.S. mfr. workplace
- Award-winning sustainability leadership





The aluminum leader for 125 years

- We invented the aluminum smelting process in 1888
- Alcoa is the largest producer of aluminum in the world
- Alcoa is the leader in aluminum technology and innovation
- Only aluminum company covering every stage of aluminum production:

Operations



Upstream

- Bauxite mining
- Alumina refining
- Aluminum smelting
- Aluminum recycling



Midstream

- Flat rolled aluminum



Downstream

- Fastening Systems
- Power & Propulsion
- Wheel & Transportation
- Building & Construction
- Forgings & Extrusions

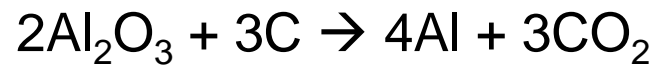
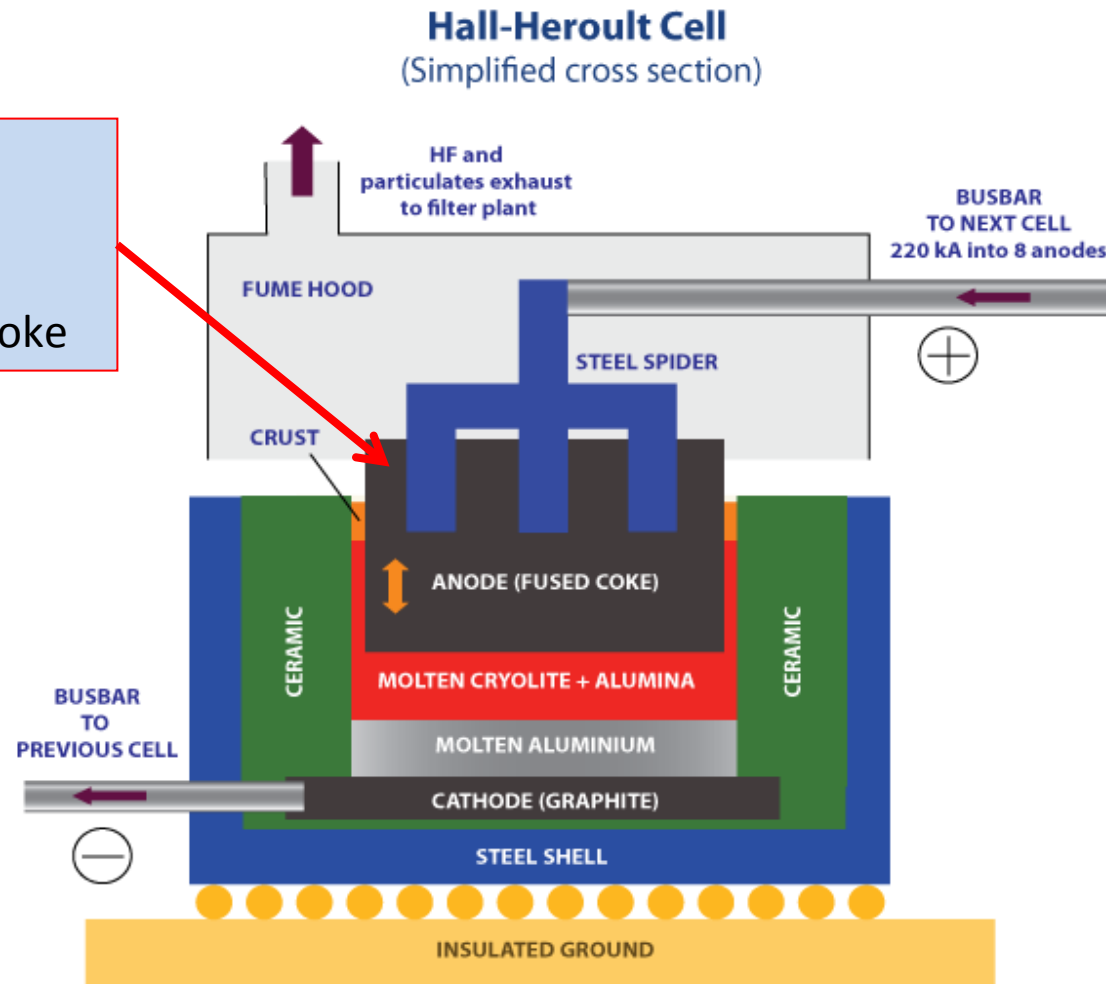







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Anodes are made from calcined petroleum coke



Not all cokes can be used to produce anodes

		<u>Appearance</u>	<u>Properties</u>
Fuel grade		<ul style="list-style-type: none"> ▪ Shot ▪ Sponge 	<ul style="list-style-type: none"> •NA
Anode grade		<ul style="list-style-type: none"> ▪ Sponge <ul style="list-style-type: none"> • Porous • < 10% BBs 	<ul style="list-style-type: none"> •Sulfur <4% •V < 400 ppm •VM < 13%
Electrode grade		<ul style="list-style-type: none"> ▪ Needle <ul style="list-style-type: none"> • Clusters of aligned needles 	<ul style="list-style-type: none"> •S < 0.6% •V < 7ppm •VM < 5.5%



Changing refining landscape is impacting North American anode grade coke supply

	1983-85	Present
Sulfur	2.6-3.5%	3.5-6.5%
Vanadium	250-350 ppm	200-600 ppm
Structure	Sponge	Sponge /Shot

- Increasing shift to fuel grade cokes
- Higher degree of variability in coke supply quality from a single refinery
- Decreasing supply of premium anode grade cokes



Coke properties are driven by crude selection and refinery operations

Crude Selections

- Gravity
- Sulfur
- Asphaltenes
- Concarbon Residue (CCR)
- Metals content

Refinery Operations

- Desalting
- Chemistry Control
- Distillation
- Slops processing
- Coking conditions
- Decoking water quality

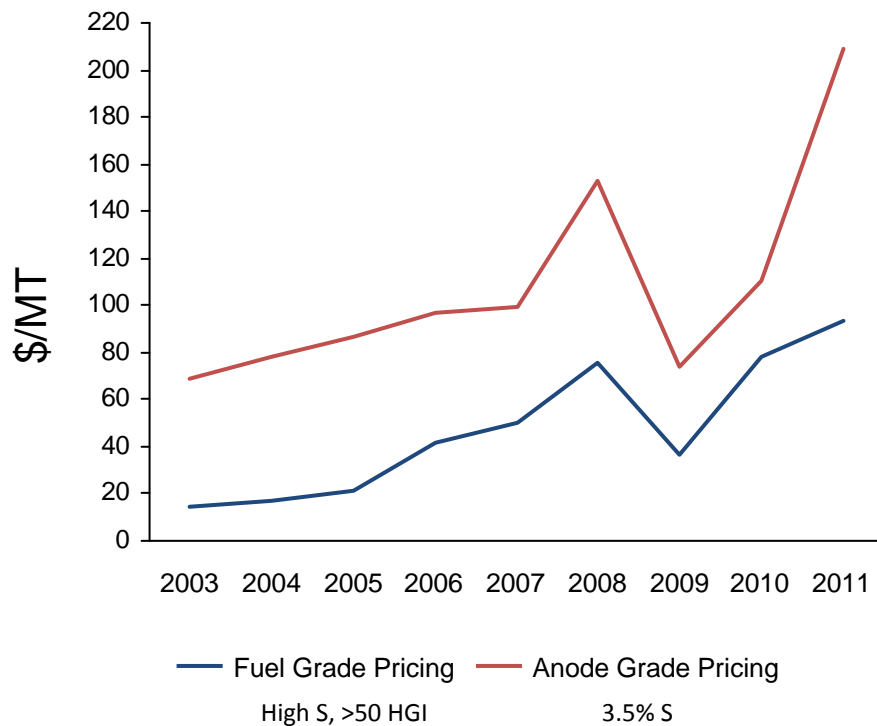
Coke Properties

- Structure
- Sulfur
- Metals
- Volatile Matter
- HGI
- Other impurities



Case studies: Refineries choosing to make anode grade coke

Price history: Anode vs. Fuel Grade



1. AG coke campaigns

- 500 kMT, med. S, med. metals
- Planned campaigns for FG /AG coke
- Batch AG mode
- Increased revenue ~\$ 18 MM for 30% AG production

2. Chemistry control

- 100 kMT, med. S, low metals, high Fe
- Planned VTB imports
- Continued phosphoric acid addition results in high phosphorous
- Opportunity to increase coke revenue by ~\$5-10 MM



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Closing comments

- Changes in crude quality and refinery operations have a significant impact on the aluminum industry
 - Long term quality changes
 - Short term quality excursions/ unpredictability

- You can make a difference
 - Increased anode grade production can be mutually beneficial
 - Predictability in coke/ crude quality helps

- We are just as interested in understanding the changes in the crude flows and its impact to refinery operations as you are



Our Vision

Alcoa. Advancing each generation.

Our Values

We live our Values every day, everywhere, collaborating for the benefit of our customers, investors, employees, communities, and partners.

Integrity

We are open, honest, and accountable.

Respect

We treat all people with dignity and provide a diverse, inclusive work environment.

Environment, Health and Safety

We work safely, promote wellness, and protect the environment.

Innovation

We creatively transform ideas into value.

Excellence

We relentlessly pursue outstanding and sustainable results.