Materials Matter:
A Life Cycle Approach to Materials Management

Ken Martchek, Alcoa Director Life Cycle & Environmental Sustainability
Alcoa at a glance

- Founded in 1888
- For 100 years was “Aluminum Company of America”
- Now 200+ locations, 31 countries
- $18.4 billion revenue in 2009
- 60,000 employees
- 10 times safer workplace than US average
- 120 years of patents, including the original aluminum process
The consideration of the entire life cycle provides a holistic picture of costs and benefits provided to society and includes consumer use and product end-of-life.
“It All Starts With Dirt”
Ecological Implications

- Derived from bauxite ore
- Land use and waste generation
- Energy and GHG intense
- Emissions
  - PAHs, Fluorides, SOx, PFCs
Aluminum

- Aluminum makes air and space travel possible
  - *All the structural alloys used in modern aircraft were developed by Alcoa*
- It can make cars and trucks more fuel efficient
  - *Aluminum replacing heavier materials in a vehicle, can help to improve vehicle fuel economy and reduce lifetime GHG emissions*
- It can make electronic gadgets more recyclable
- It’s one of most popular, most recyclable beverage containers.
  - *More than one trillion cans have been recycled in America since Alcoa pioneered the industry in 1972*
- It can help make buildings more energy efficient
Life Cycle/ Sustainability Approach
In Practical Terms:
Alcoa Life Cycle Materials Management

**Sustainability of Resources:**
Access to natural resources and energy
Neighbor and employer of choice

**Sustainability of Our Operations:**
Social license to operate
Environmental excellence

**Sustainability of Our Material in Products:**
Innovation – new products and markets
Conservation and use of EOL aluminum
Alcoa Sustainability Model

Sustainability of Products
- Environmental
  - Life Cycle Assessment
  - Product Design
- Social
  - Consumer Awareness
  - Supply Chain Management
- Economic
  - Economic Value of Products

Sustainability of Resources
- Environmental
  - Land Management
  - Biodiversity
  - Water Conservation
- Social
  - Purchasing Standards
  - Conservation Investments
- Economic
  - Security of Supply
  - Competitive Pricing

Sustainability of Operations
- Environmental
  - Climate Change
  - Energy
  - Water
  - Material Use
  - Recycling
  - Emissions & Waste
- Social
  - Health
  - Safety
  - Our People
  - Wealth Generation
  - Community
  - Stakeholder Engagement
- Economic
  - Financial Performance
  - Shareholder Value
  - Capturing Growth
(International Aluminum Institute)

Values in millions of metric tons

Source: GARC, March 10
Examples

Sustainability of Resources:
Access to natural resources and energy
Neighbor and employer of choice
Land Stewardship

- Reclamation
- Conservation
- Biodiversity mgmt.

Alcoa-sponsored environmental parks, Brazil

Award-winning forest restoration, Australia

Great Smoky Mountains conservation agreement, USA
Massena, New York
- 30-year NYPA agreement through 2043
- 10-year extension option
- $600 million upgrade investment through 2012
- 70% emissions reduction
- 19,000 mtpy capacity increase to 274,000 mtpy

Fjardaal, Iceland
- New Hydro based smelter in full operation (2009) with 30 year power contract

Wenatchee, Washington
- Sustainable power through 2028
- New pot-line, more jobs

Quebec, Canada
- Energy secured for three smelters through 2040/ $1.2 billion upgrades
Examples

Sustainability of Our Operations:
Social license to operate
Environmental excellence
GHG Emissions Management

- Reduction of Persistent GHG emissions (perfluorocarbons)
- Partnership with USEPA
  *Voluntary Aluminum Industrial Partnership*
- Example of Pollution Prevention
  - Improved Operating Practices
  - Better Control Software
  - Upgraded raw material feeding & distribution
- 90% reduction in global PFC absolute emissions since 1990
  - Consistent, stable reaction
  - Concurrent energy savings
- Best practices shared across the industry
Reduce wastes to landfills by 50% by 2008

Reduce process water use by 60% by 2008
Sustainability of Our Material in Products:

- Innovation – new products and markets
- Conservation and use of EOL aluminum
Aluminum Allows for Larger (i.e., Safer) Vehicles Without Added Weight
Example: China Transit Bus

- Alcoa Partnership with Yutong bus of ZhengZhou, China
- On the road July 2008 in Beijing
  - Reduction in CO₂ emissions
  - Reduced road surface wear and tear
  - Less fuel
  - Lower maintenance (tires, brakes, suspension)
  - Improved corrosion resistance
  - Payback of 2-3 years

- Weight Reduction of 1,400 kg (12%)
- >6% Fuel Economy Improvement
- 50 Tons of CO₂ Lifetime

- Aluminum Space Frame: 800 Kg
- Aluminum Wheel s: 170 Kg
- Aluminum Body Panels: 550 Kg

- Weight Reduction of 1,400 kg (12%)
- >6% Fuel Economy Improvement
- 50 Tons of CO₂ Lifetime
Product Recycling Matters to Aluminum

- Approximately 75% of all aluminum ever smelted is still in use
- Recycling saves 95% of the energy to produce an aluminum ingot
- Alcoa reuses about **17 billion** used beverage cans per year in Alcoa, TN.

We purchased about **800,000 metric tons** of all forms of recycled aluminum last year.

In 2009, we inaugurated a **$20m can recycling expansion** in Alcoa TN to expand outlets for scrap.
Alcoa’s Role in Promoting Recycling & Markets

- **Basic Behavioral Education- Change the Mindset.**
  - Sponsorship of local, regional, national and international recycling-focused NGO

- **Support Efforts to Build Recycling Infrastructure.**
  - Recycling bin grants programs in Australia & USA
  - Seed capital to curbside recycling programs (70% of supply)
  - Collaborations with leading beverage companies
  - Corporate partnerships with other recycling consumers (paper, glass, plastic)
  - Mobilize greater support from Material Recovery Facility Owner/Operators
  - Improve quality of Material Recovery-sourced aluminum

- **Support Legislative Initiatives That Promote Recycling.**

- **Provide Long Term Markets for Recyclable Material.**
Life Cycle/ Sustainability Deployment
Tackling Life Cycle Management Challenges

- Organization silos do not encourage sharing of information

- Several independent initiatives were underway at all levels of the company
  - Environmental conservation efforts
  - Life Cycle assessments
  - Efforts to increase recycling rates
  - Partnerships with Associations and NGOs

- No centralized approach to addressing issue
### Current Alcoa Global Environmental Goals

**Progress Towards 2020 Vision**

% Reduction from 2000 Baseline

<table>
<thead>
<tr>
<th>Goal</th>
<th>2008</th>
<th>2009</th>
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</thead>
<tbody>
<tr>
<td><strong>Landfilled Waste</strong></td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Water Use</strong></td>
<td>40</td>
<td>40</td>
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<tr>
<td><strong>SO2</strong></td>
<td>30</td>
<td>30</td>
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<tr>
<td><strong>Mercury</strong></td>
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<tr>
<td><strong>NOX</strong></td>
<td>20</td>
<td>20</td>
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<tr>
<td><strong>VOC</strong></td>
<td>60</td>
<td>60</td>
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<tr>
<td><strong>Greenhouse Gases</strong></td>
<td>20</td>
<td>20</td>
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</tbody>
</table>

2008 Goal

From 1990 baseline

Alcoa will be announcing new global voluntary 2020/2030 goals in April
### Alcoa Sustainability Deployment

<table>
<thead>
<tr>
<th>Sustainability Steering Committee</th>
<th>Committee is team of Alcoa senior executives</th>
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#### 5 Core Programs

<table>
<thead>
<tr>
<th>Legislation &amp; Metric Methodology</th>
<th>Carbon Footprint &amp; Primary</th>
<th>Environmental &amp; Social Dimension</th>
<th>Product Positioning</th>
<th>Messaging</th>
</tr>
</thead>
</table>
| Legislation regional status & implication | Alcoa current state | Environmental Footprint:  
- Land/water use  
- Biodiversity | Market & product analysis | Key messages  
- Core to Brand  
- Megatrends  
- Innovation  
- Substitution benefits  
- Life cycle proof |
| Build Corporate-NGO Coalitions | Competitive analysis  
- Aluminum co.  
- Other materials | Life cycle analysis | Competitive analysis  
- Products |
| Metric Methodology  
- Analysis of methodologies  
- Preferred position | Levers  
- Energy source  
- Process  
- Technology  
- Recycle strategy | Resource efficiency:  
- Material use  
- Waste min | Emerging trends |
| | Carbon credits  
- Generated  
- Traded | Social responsibility:  
- Employees  
- Communities  
- Supply chain | Innovative products |
| | | | Recycle & scrap utilization |

#### 3 Foundational Programs

- Carbon Credit Generation  
- Common Metrics  
- Recycling / Recyclability Efforts
Reducing Greenhouse Gas Emissions in production

Policy: founding member of USCAP, etc.

Through use of products: aluminum is part of the solution

Alcoa Percent Reduction from 1990 – Absolute Global GHG Emissions (CO2e)
Final Message: Recycle... It Pays

Spokane couple fund castle wedding by recycling cans