



From aluminium to bauxite residue (red mud) - When circularity works and when it's more of a struggle

SINTEF Circular Economy Conference

June 3, 2019. Langesund.

Linda Wiik, Hydro.



Ambitious goals

Recycling & CO₂

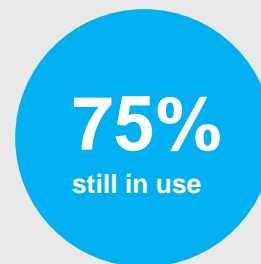


Greener:

Lead the transition towards sustainable solutions

Aluminium

One of the most recyclable of all materials



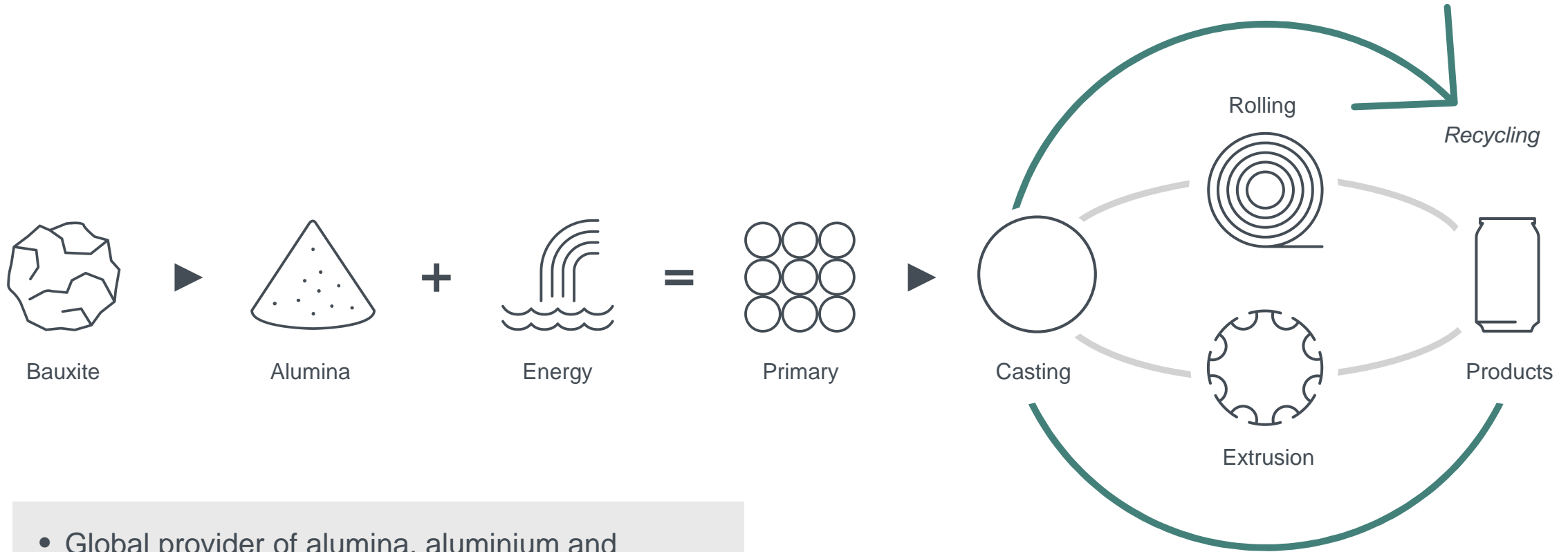
Bauxite Residue

Our big challenge



Waste versus CO₂ - emissions

Hydro – An integrated aluminium company



- Global provider of alumina, aluminium and aluminium products and solutions.
- 35,000 employees at 150 locations in 40 countries
- Annual revenues NOK 109 billion (2017)
- Included in Dow Jones Sustainability Indices, Global Compact 100, FTSE4Good.

Aluminium – Building block for the low-carbon, circular economy



1/3 density of steel means lighter vehicles, lower energy consumption and reduced emissions.



The superior food preservation properties of aluminium packaging reduces food waste meaning reduced emissions.

Ambitious goals: recycling and CO₂ emissions

- Recover 1 million tonnes of contaminated and post-consumer scrap aluminium annually by 2020.



- Carbon-neutral from a life-cycle perspective by 2020



Aluminium - One of the most recyclable of all materials



5%
to recycle

75%
still in use



Growing in recycling

Investments:

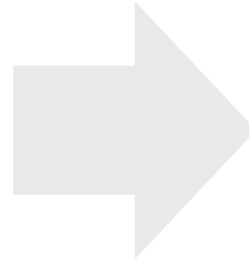
- Ex.1: Dormagen, Germany: scrap shredding and sorting plant
- Ex. 2: Neuss, Germany: UBC recycling line.

R&D:

- Ex.1: Alloy sorting (LIBS)
- Ex.2: Development of recycling friendly alloys.
- Ex.3 Circular aluminium packaging (Alpakka)

Certification:

- Development of traceability and quality principles (DNV GL)



- Increasing post-consumer scrap usage
- Increasing RFA sales



Product with minimum 75% post-consumer recycled aluminium



Recycling - making circular economy a reality



Advanced recycling plants for scrap shredding, sorting and recycling



Dormagen, Germany:
**Scrap shredding
and sorting plant**

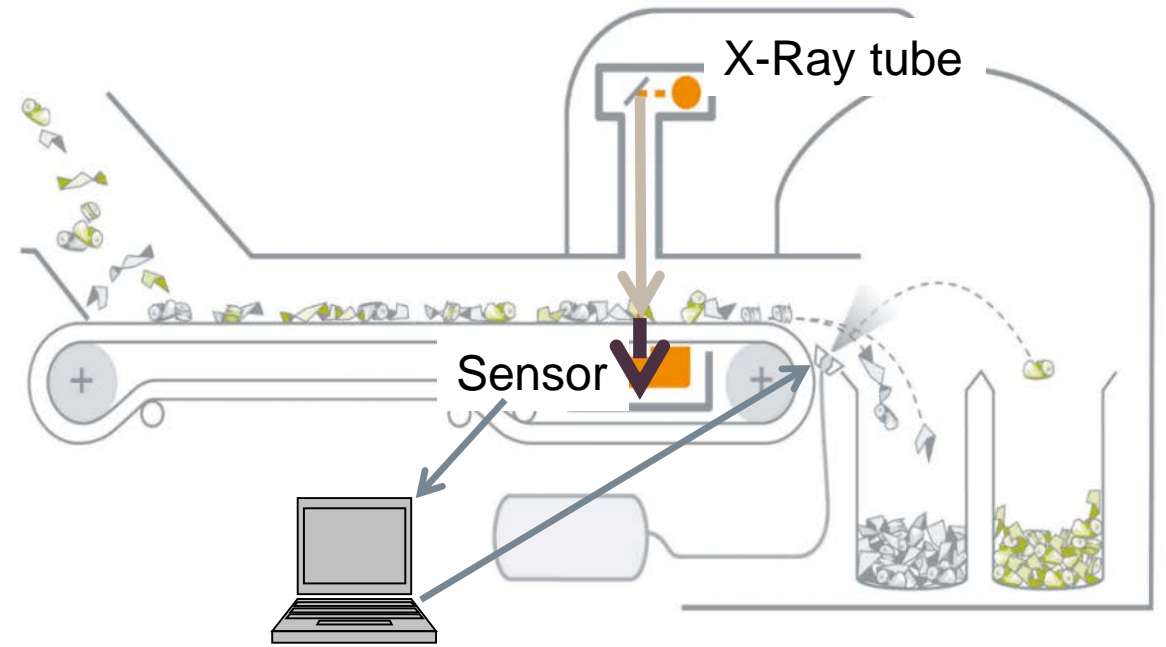
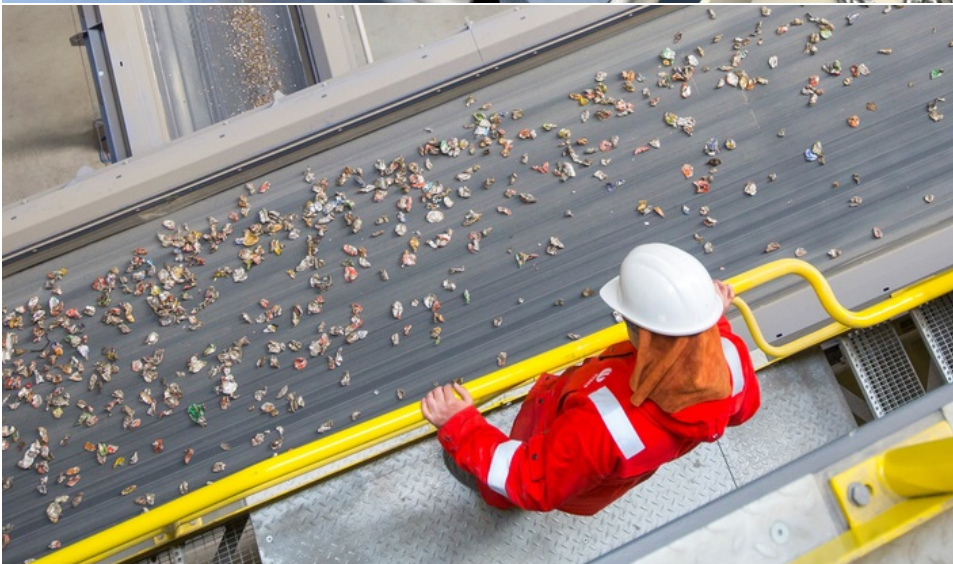


Neuss, Germany:
UBC recycling line



Clervaux, Luxembourg:
**Recycling plant
upgrade**

Sorting technology

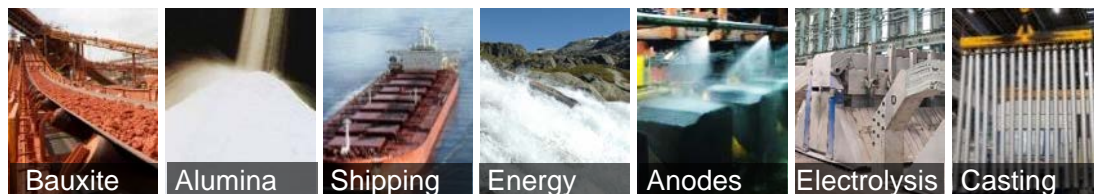


Source TiTech

Low-carbon products

Unique advantages through integrated value chain, renewable energy and post-consumer recycling

Hydro 4.0

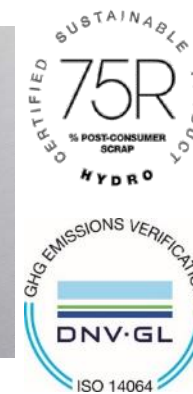


All-in approach

Maximum
4.0 kg CO2e/kg Al

Verified by
ISO 14064 by DNV GL

Hydro 75R



Minimum 75%
post-consumer
Recycled aluminium

Verified by DNV GL based on
traceability and quality principles
developed by Hydro

Recycling of aluminium food packaging

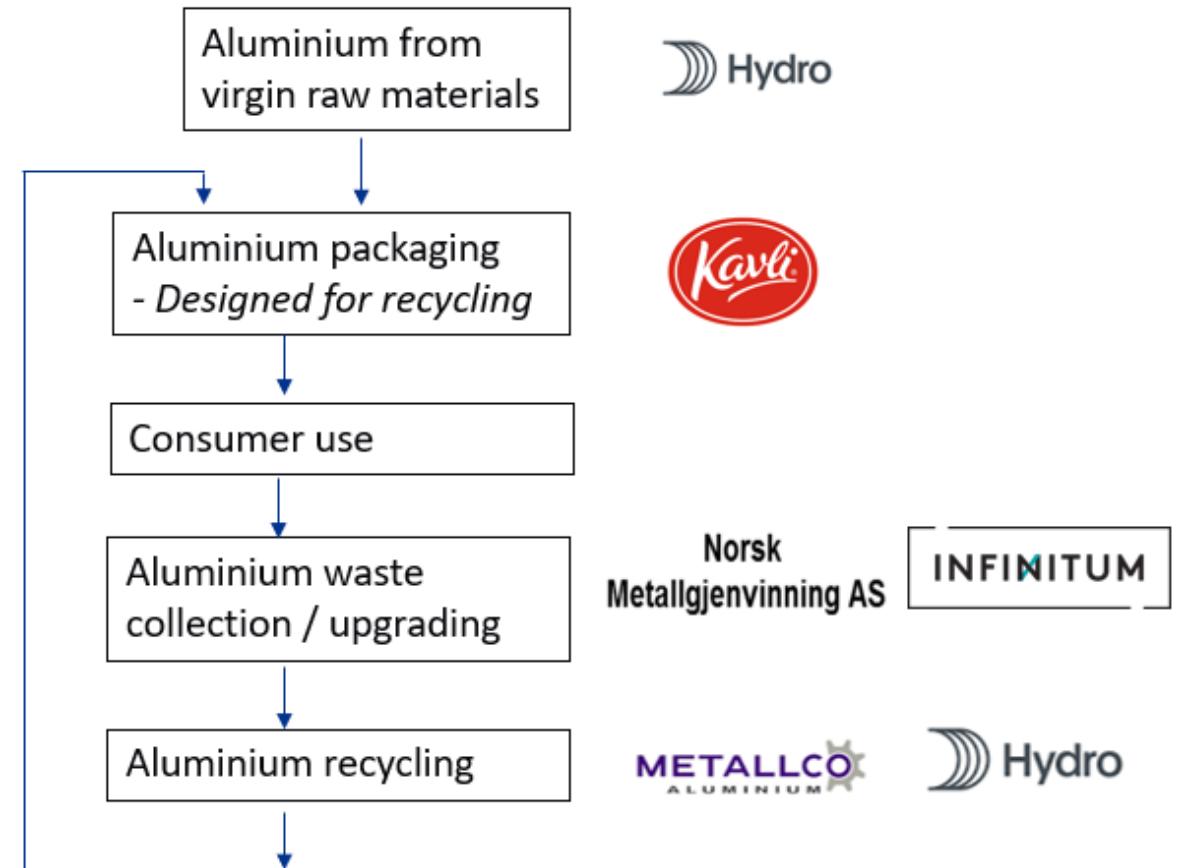


Aluminium food packaging:

- Most of the aluminium lost to waste incineration and landfill comes from aluminium packaging.
- The short loop time of aluminium packaging, as compared to e.g. building materials with a loop time of approximately 40 years, makes this waste volume comparatively large.
- Recycling challenges: food residues, multi-materials (e.g. aluminium + plastics), multi-alloys.

Circular aluminium packaging in Norway:

- Aims to establish a Norwegian flagship demonstrator for circular economy in practice which will increase the aluminium packaging circularity, by value-chain cooperation between collectors, packaging designers (food producers) and recyclers.



Bauxite Residue (red mud) - Our big challenge

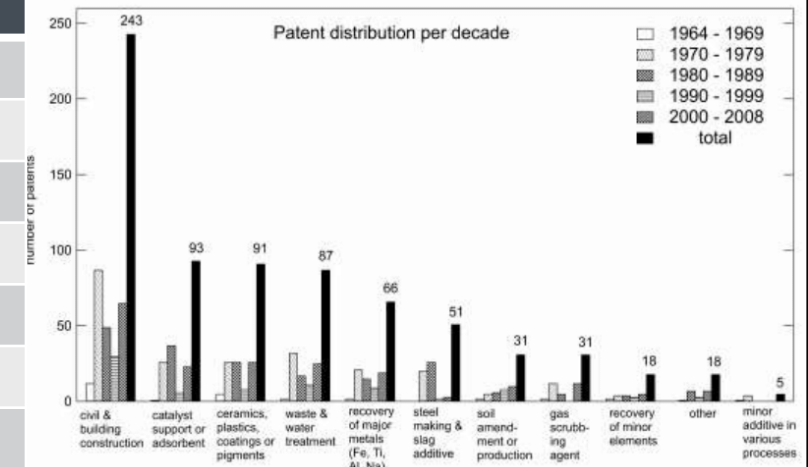
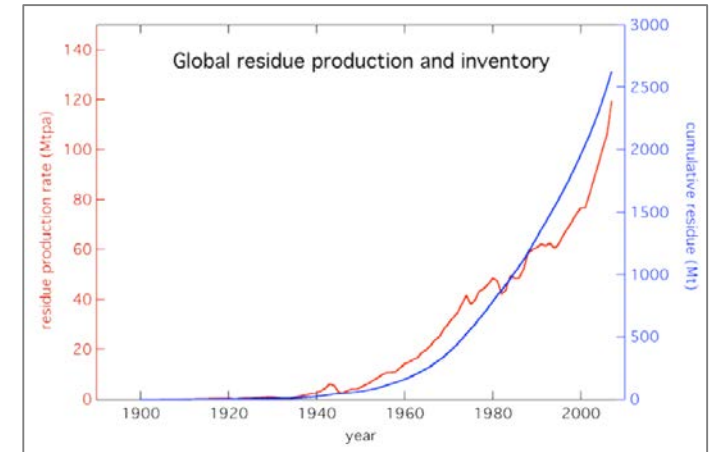
- Key issues:

- Mineralogically and chemically complex.
- High pH
- Fine particle size
- Moist
- Large volumes typically in remote locations (= cost and CO₂ footprint of transport).
- Use options typically competes with low-cost virgin raw materials that are less energy demanding to process (waste versus CO₂-emissions).



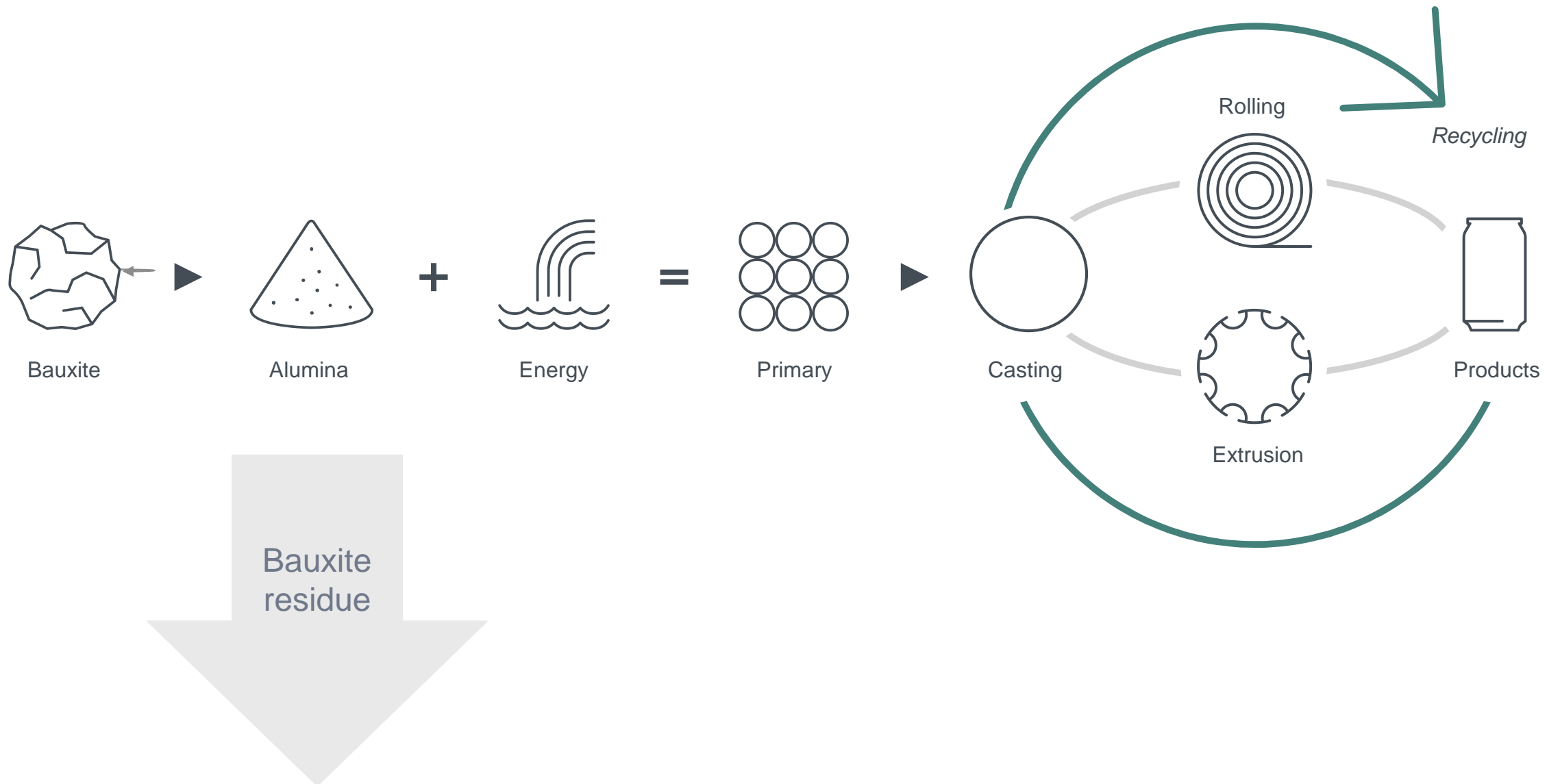
Mineralogical components

Hematite	
Goethite	
Gibbsite	
Anatase	
Rutile	
Quartz	
DSP*	

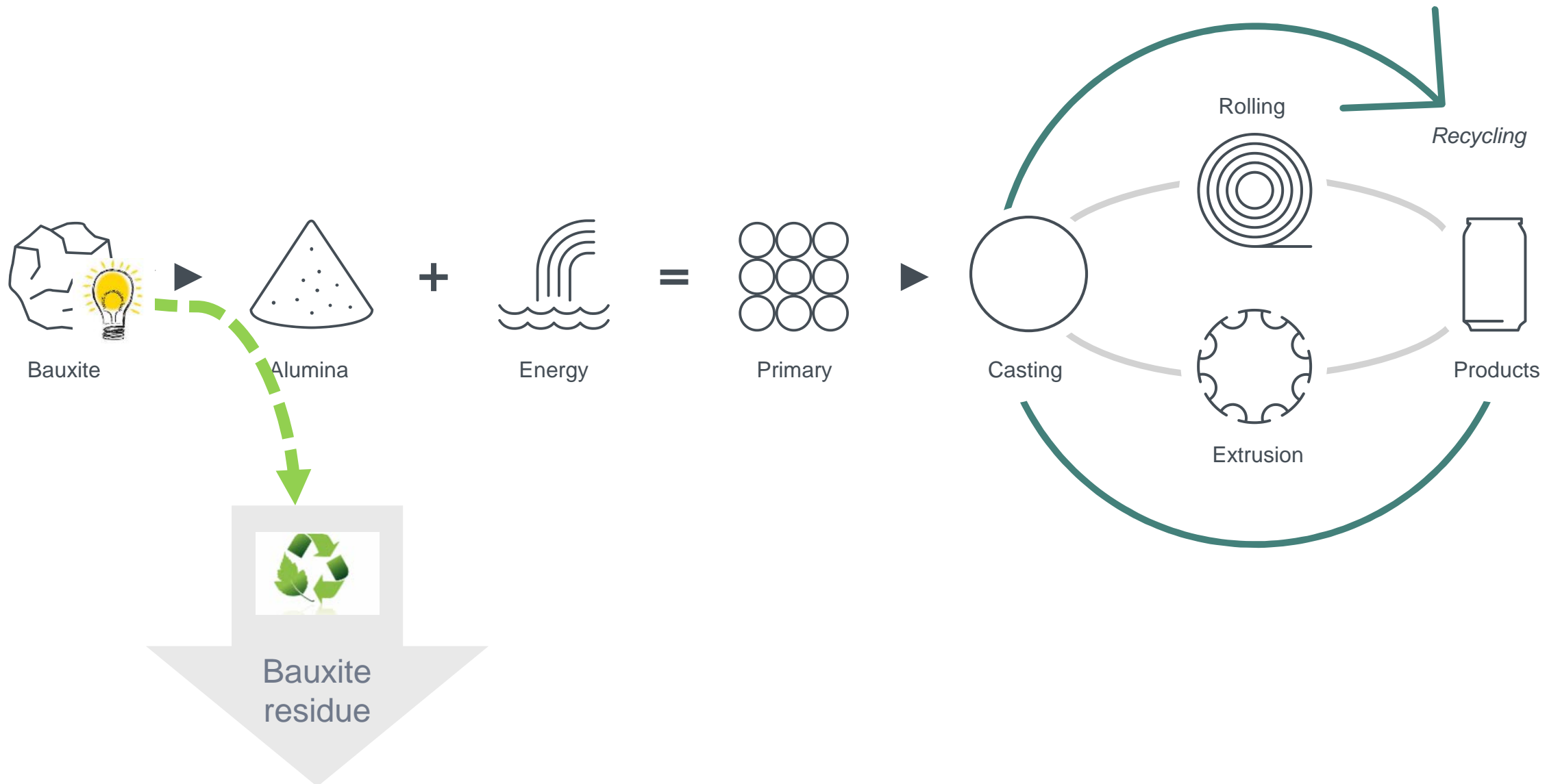


DSP (de-silication product) is a sodium aluminium silicate: Na₆[Al₆Si₆O₂₄]Na₂X.

How to approach the bauxite residue challenge



How to approach the bauxite residue challenge



How to approach the bauxite residue challenge

- Solve the problem as early as possible in the value chain:
 - Prevent the waste
 - Modify the properties of the waste
- Use as feedstock for another industry.
 - E.g. cement (collaboration project with Norcem and Heidelberg Cement).
- (Alternative alumina / aluminium production processes)





Ambitious goals

Recycling & CO₂

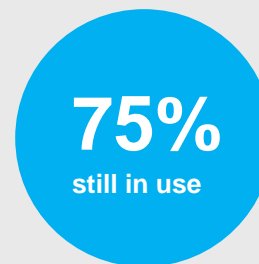


Greener:

Lead the transition towards sustainable solutions

Aluminium

One of the most recyclable of all materials



Bauxite Residue

Our big challenge



Waste versus CO₂ -emissions



Hydro

We are aluminium

