



HYDRO

Aluminium production efficiency while reducing PFC emissions

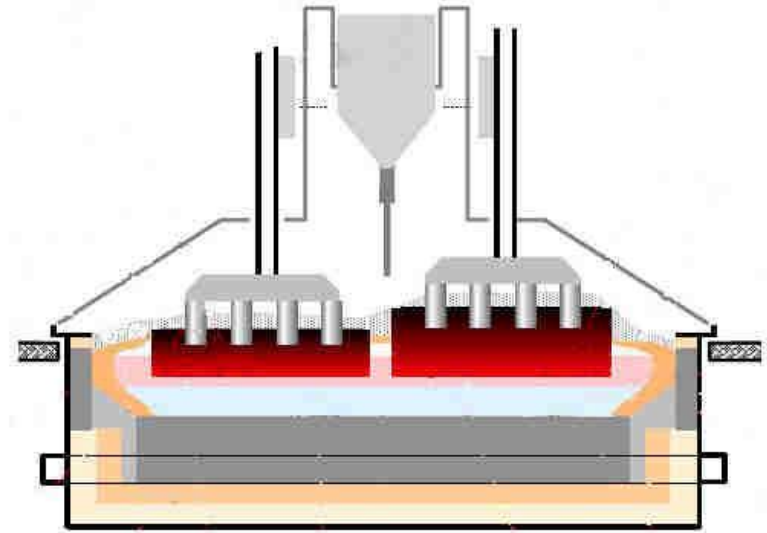
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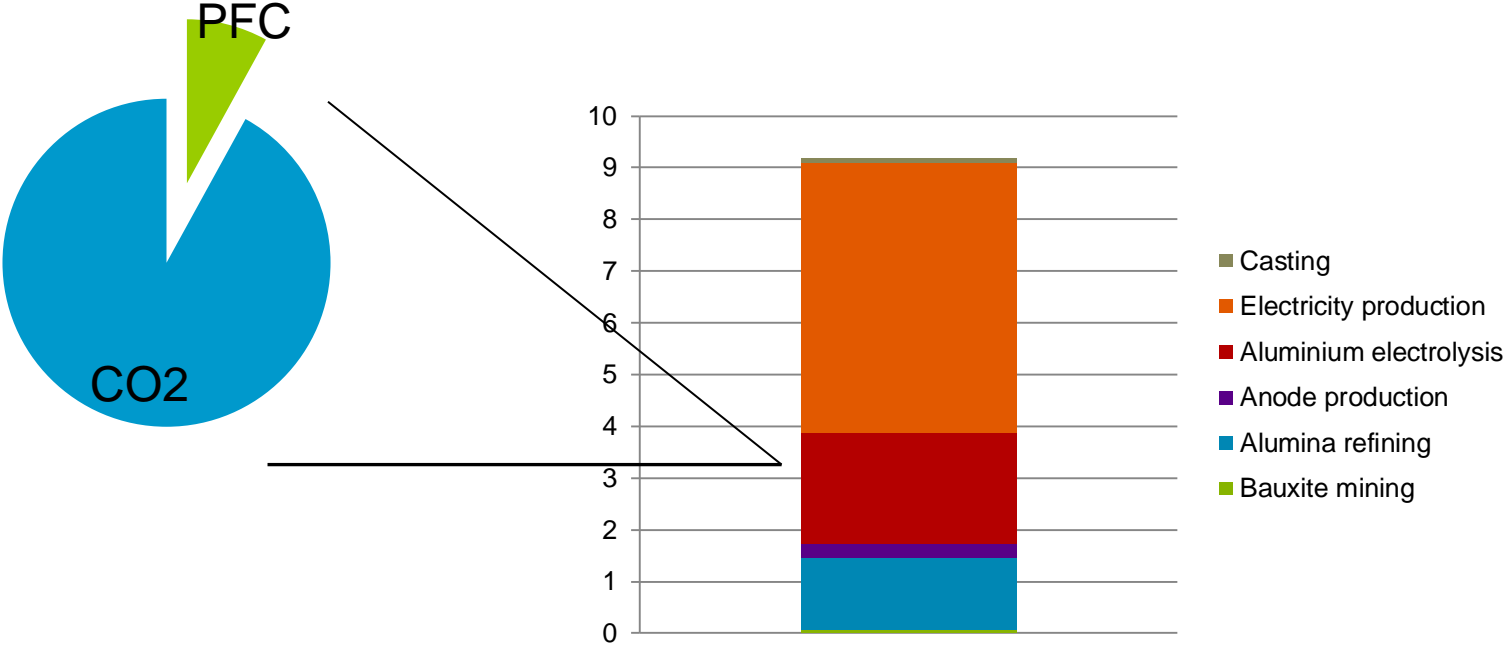
2014-10-22

What is PFC?

- PFC = per-fluor-carbones
 - CF_4 GWP = 7 390 kg $\text{CO}_2\text{e}/\text{kg}$
 - C_2F_6 GWP = 12 200 kg $\text{CO}_2\text{e}/\text{kg}$
- Caused by reaction between the electrolyte and the anode in the aluminium electrolysis process – so called anode effects
- Unstable production = high PFC emissions



Carbon footprint of aluminium



Development in PFC emissions

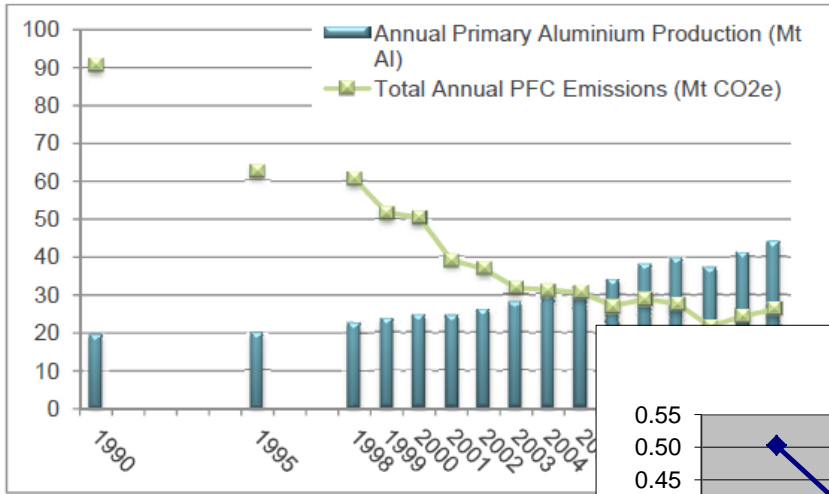
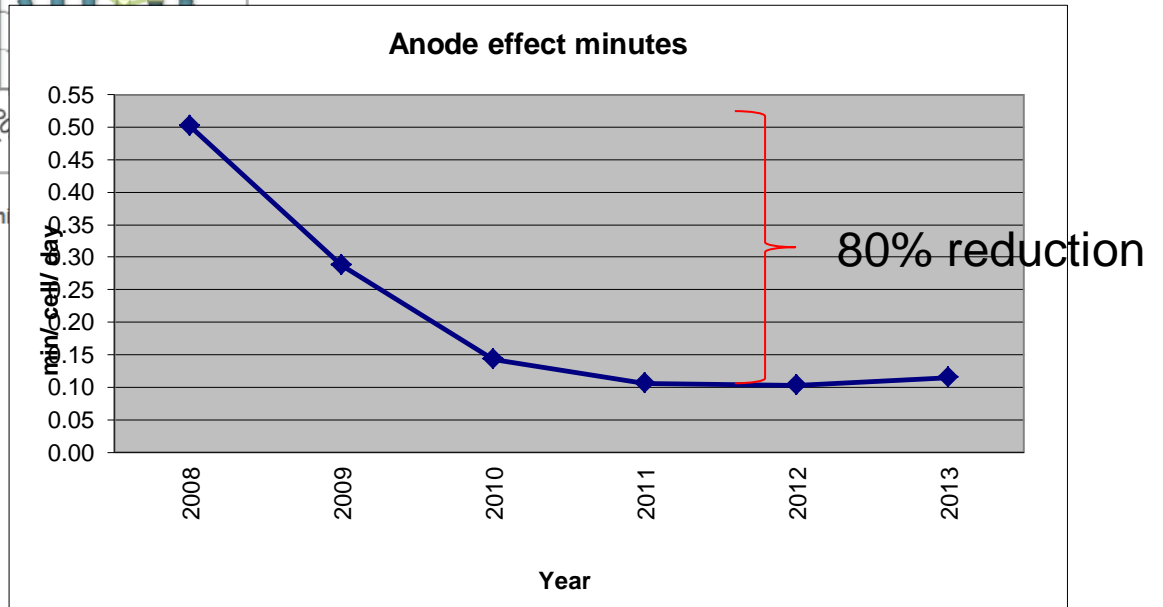


Figure 9 – Absolute PFC emissions (as CO₂e) and primary aluminium production



How did we get there?

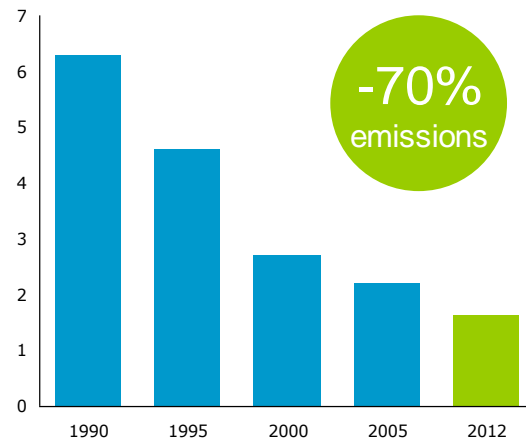
- Stricter regulations has led to increased focus
- Phase out of old technology
- New technology elements
- Operational stability
- Good, fact-based dialogue with the authorities
- High level research on the relation between operational control and emissions has led to increased understanding and better operational stability
- Good control = high efficiency = low emissions

Way forward

- Potential for further reductions in PFC emissions is limited
- No technological breakthrough is expected in the foreseeable future
- EU ETS puts pressure on further emission reductions
- GHG reductions will come in the form of reduced anode consumption and higher energy efficiency
- Aluminium as a metal is an enabler for GHG savings in other sectors (like transport and buildings)

Lower emissions

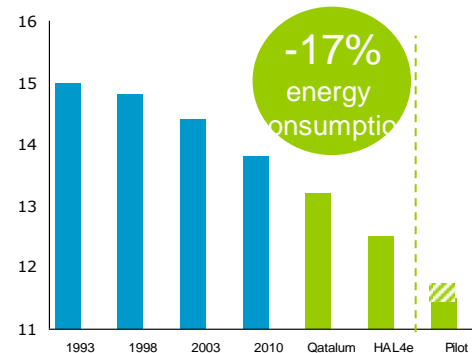
kg CO₂e / Kg aluminium



Average specific emissions from Hydro's Norwegian smelters

Improved energy-efficiency*

kWh / Kg Aluminium



Average specific energy consumption from 100%-owned Norwegian smelters

