

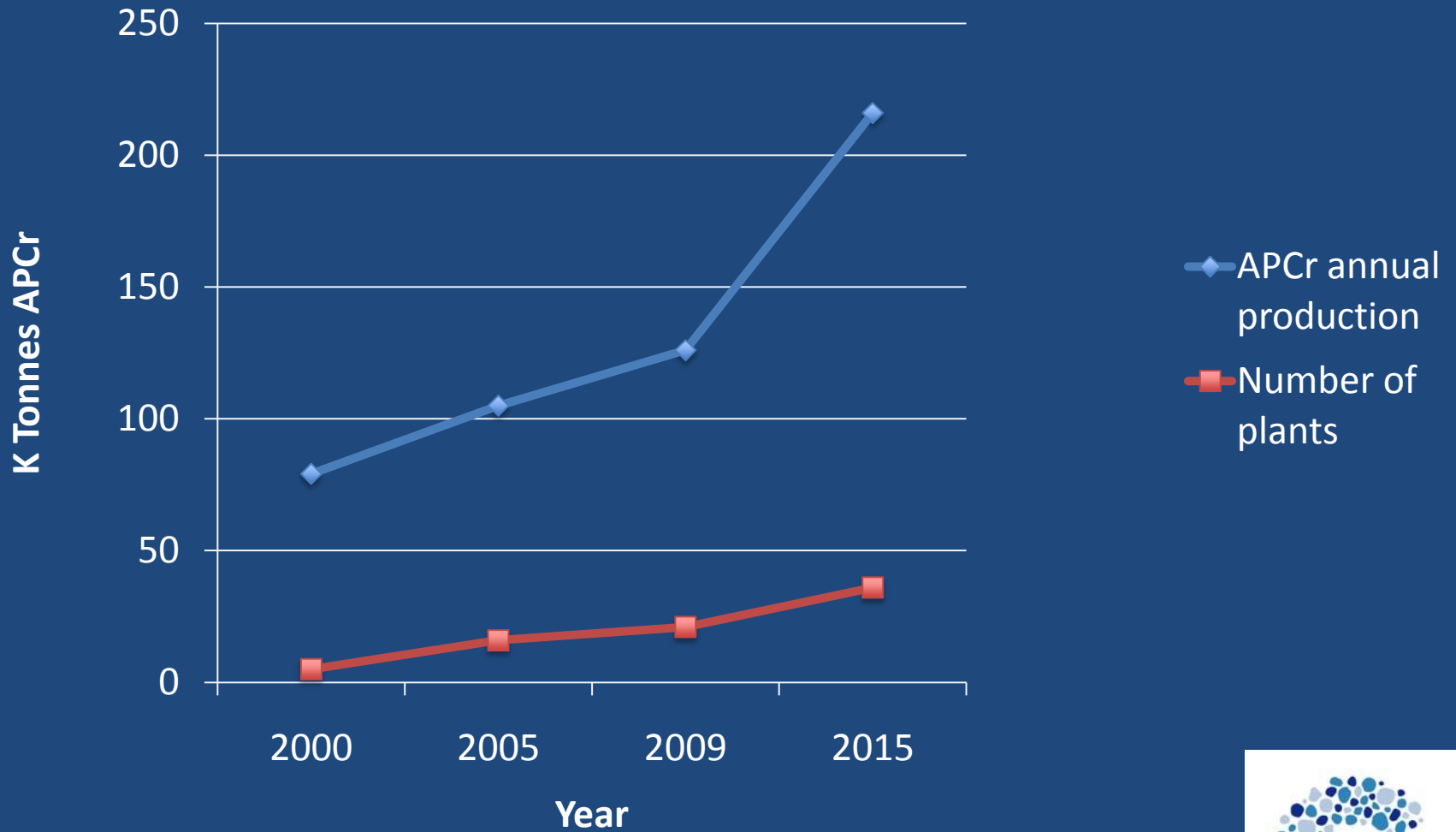
# Manufacture of Aggregate from Air Pollution Control residues (APCr)

Mark Orsbourn

Carbon8 Aggregates Ltd

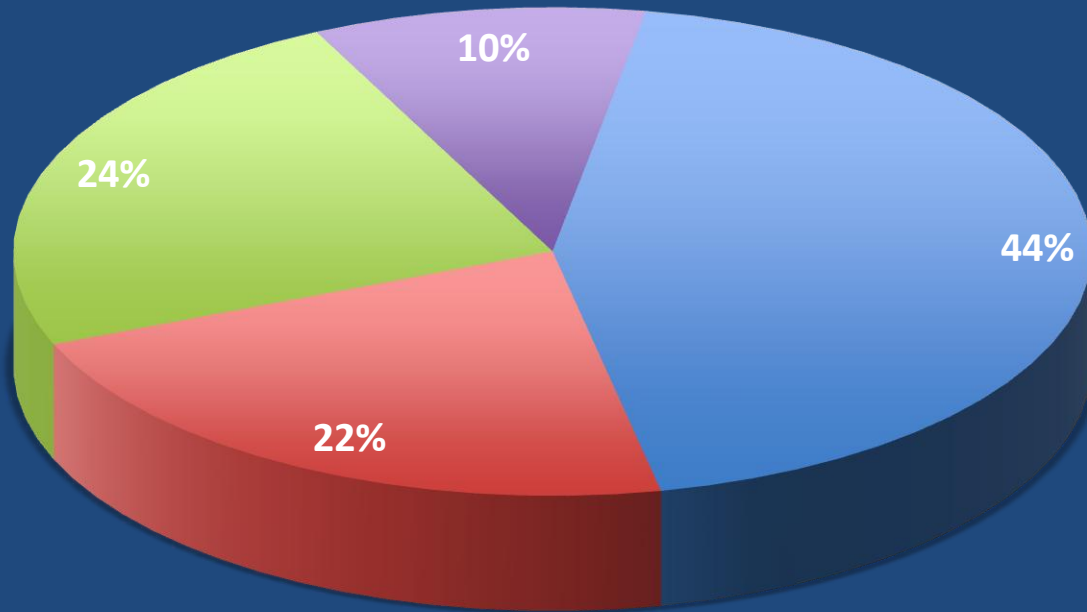


## Trend in APCr production



# Principal disposal routes, 2010

- Hazardous Waste Landfill
- Acid Treatment
- Long Term Storage
- Other



# Hazards associated with APCr

- Absolute entry in EWC 19.01.07
- Irritancy (H4)
  - High pH and free lime content
- Ecotoxicity (H14)
  - Heavy metal content
  - Not sufficient to be 'toxic' or 'harmful'
- Problematic content for hazardous waste disposal:
  - Chlorides
  - Lead
  - Total Dissolved Solids
  - Fine Grained Particles

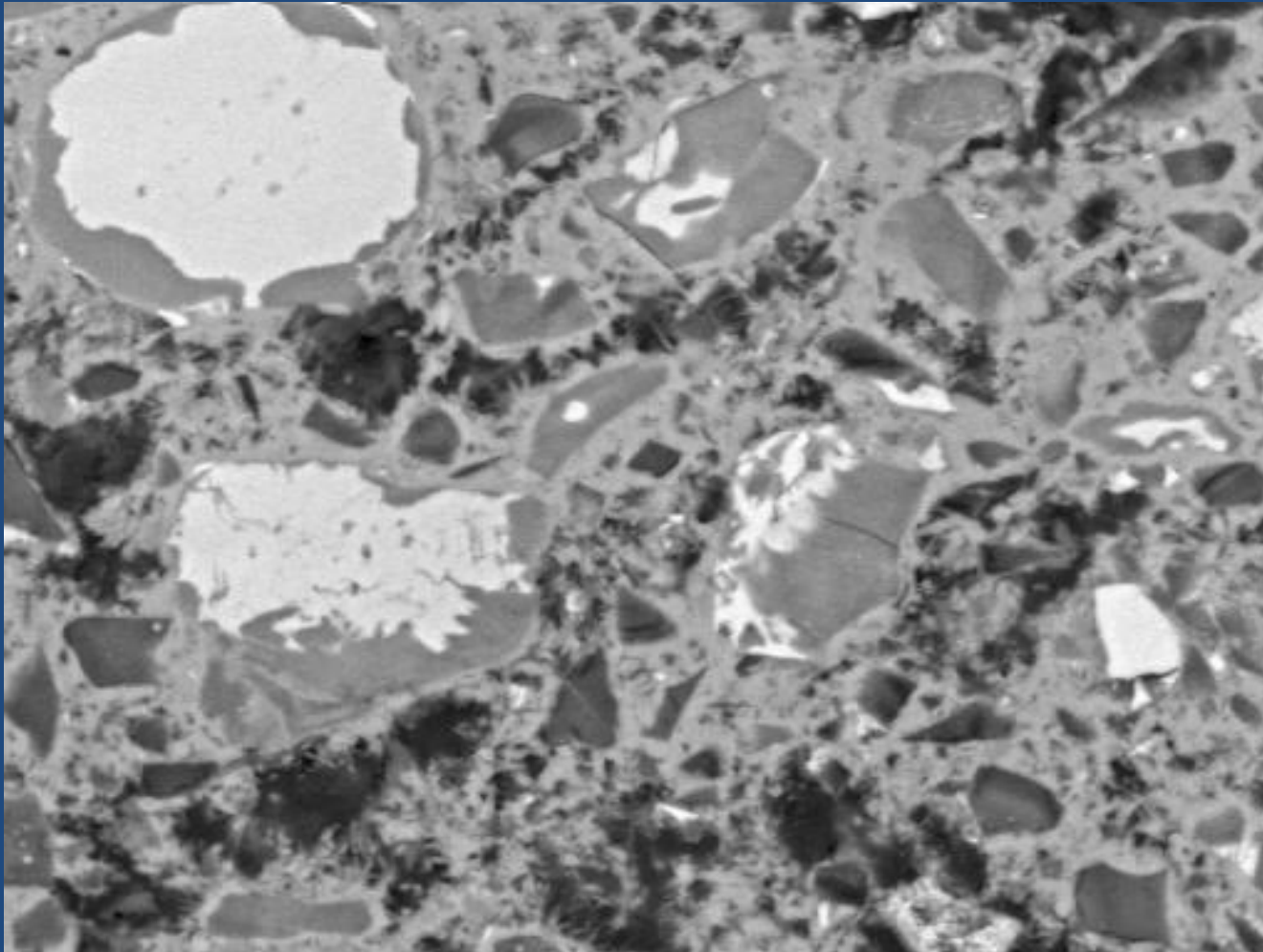


# Accelerated Carbonation

- Carbon Dioxide reacts with Lime and other Calcium compounds
- Forms Calcium Carbonate - Calcite -Limestone
- Reduces pH
- Reduces leachability of Lead, Zinc etc
- Calcite acts as a cement, binding grains together



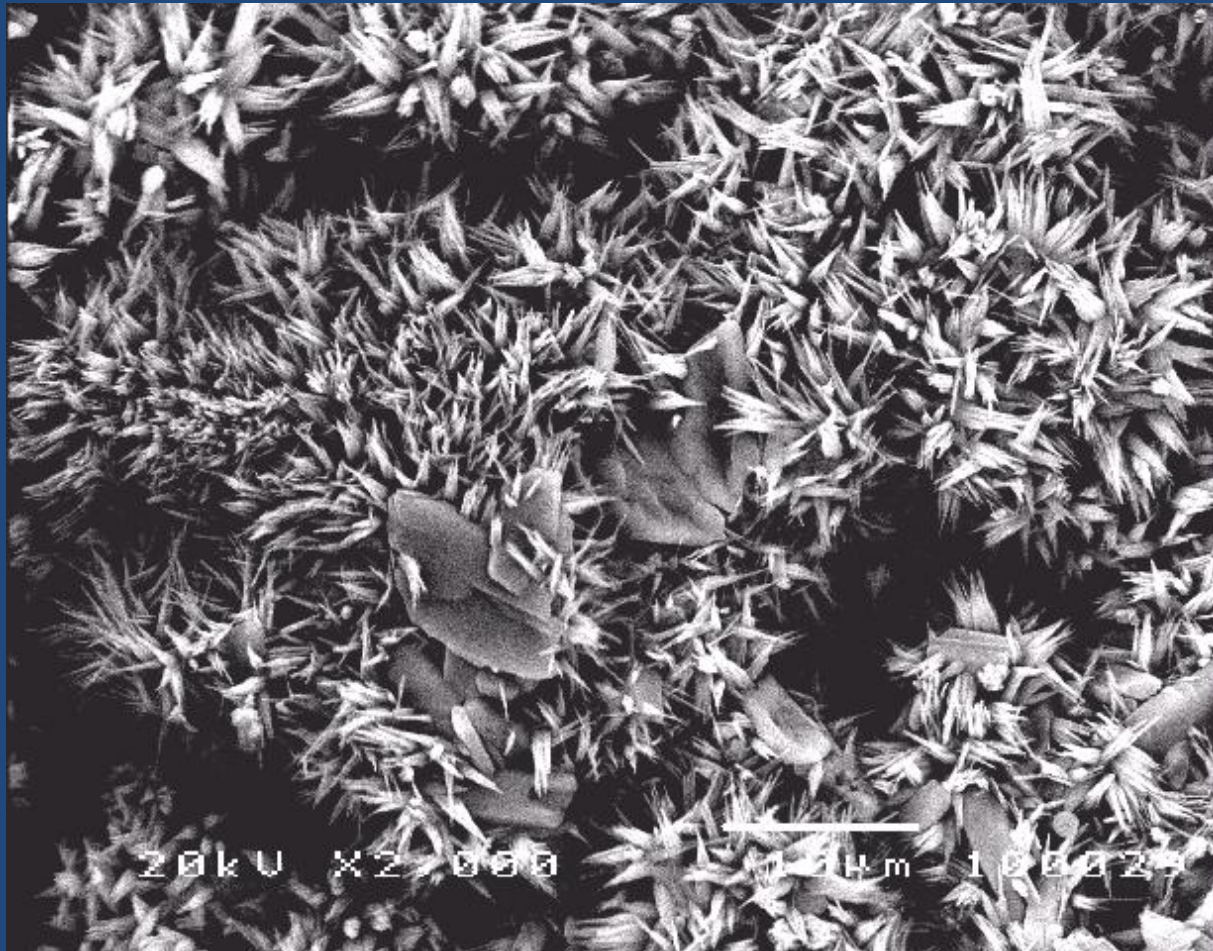
# Matrix of accelerated carbonated hazardous waste



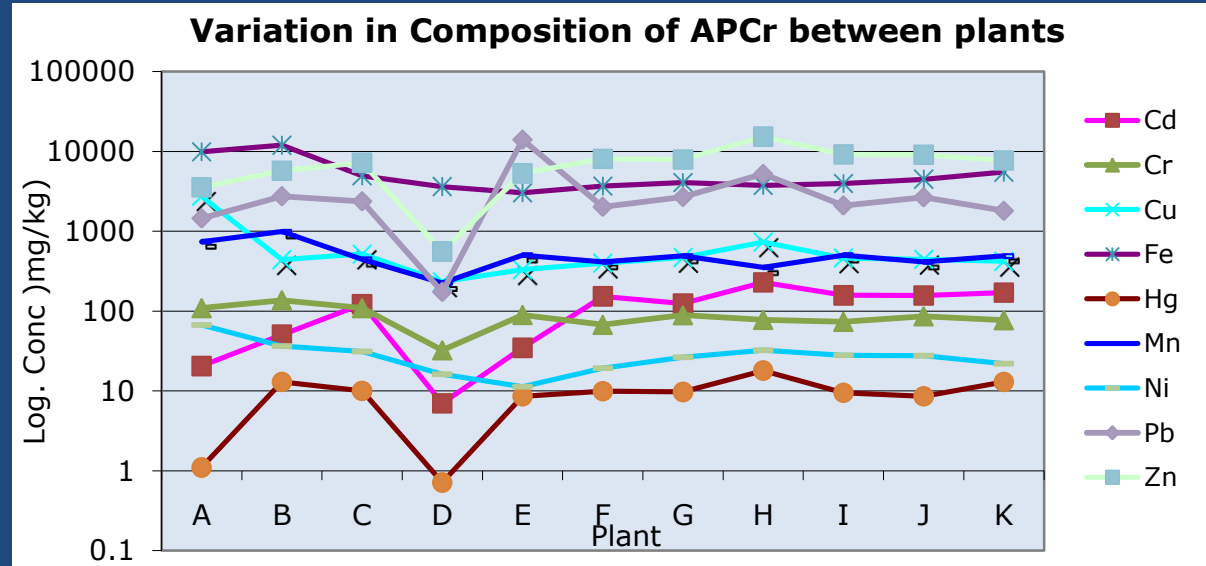
50  $\mu\text{m}$



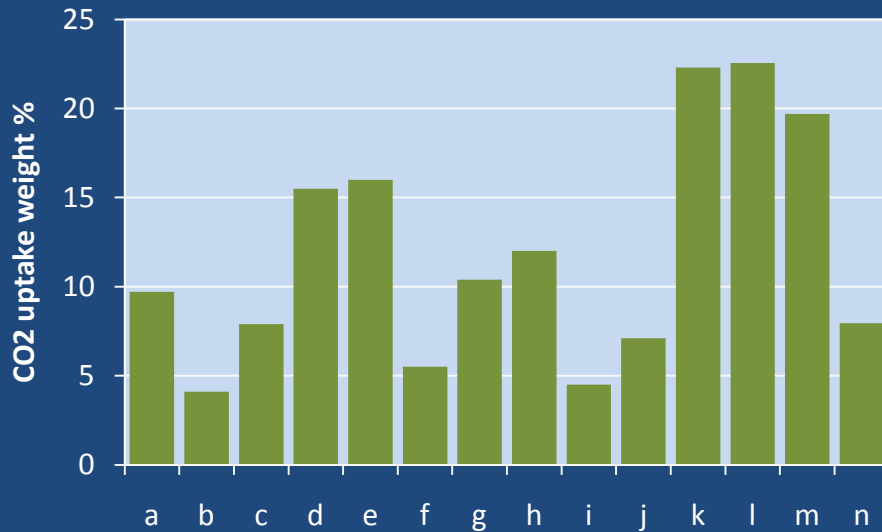
# Polymorphs of Calcium Carbonate



# Variation Between APC residues



## CO2 uptake for different plants



# Demonstration

- Moist residue in bottle
- Add  $\text{CO}_2$  from soda stream
- Exothermic reaction
- Gas absorbed by solid creating a vacuum in the bottle
- Bottle collapses as  $\text{CO}_2$  converted to  $\text{CaCO}_3$



# Manufacture of aggregate

- Treat APCr with Accelerated Carbonation Technology (ACT) (Patent 1)
- Mix product with binders and fillers
- Pelletise in Carbon dioxide (Patent 2)
- Use in concrete block manufacture as replacement for virgin aggregate
- Blocks (7.3N) meet BS 771-3 but lighter

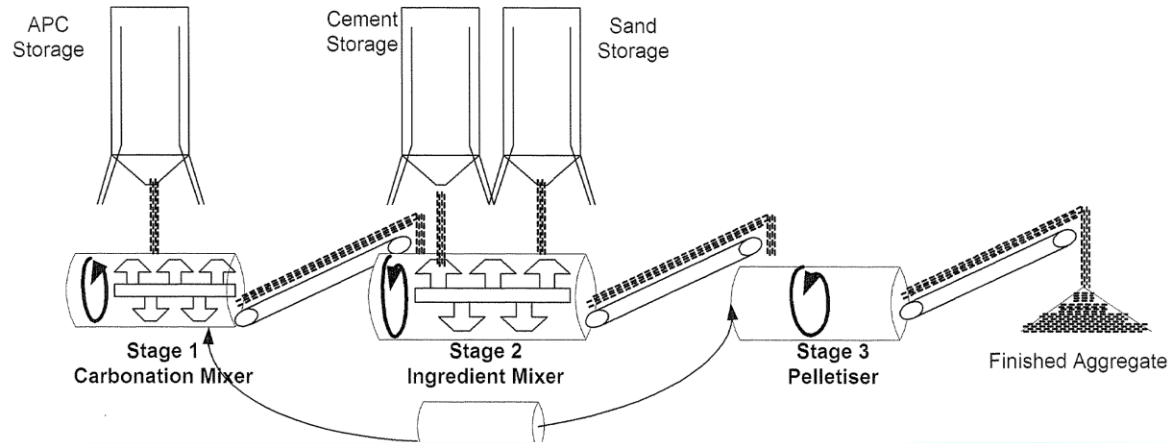


# Theory to practice

- Captured waste CO2 trial August 2010
- Scale Pilot plant (bottled CO2) Nov-Dec 2010
- Treated APCr from many sources
- Manufactured +300 tonnes of aggregate
- Supplied major block manufacturers
- Blocks tested by UKAS accredited lab's
- C8Aggregate- EA confirmed 'End of Waste'



## Simplified View of 3 stage Carbon8 Aggregates Process.



**Stockpile of manufactured  
Carbon8 Aggregate**



**Sample of trial Blocks, manufactured  
with Carbon8 Aggregate**



**Pellets Leaving  
Process Conveyor**



# Full Production Block Manufacturing



# Commercial Reality

- Patented Technology
- Blocks passed industry tests & UKAS accredited
- End of Waste status granted August 2011
- Plant 1 under construction
- Commissioning December 2011
- First plant using bottled CO<sub>2</sub>
- Contracted APCr and Aggregate volumes
- Second plant site under discussion



# What Does Carbon8 Aggregates Do

- APCr Recycling
- Eliminate APCr to Landfill (direct or indirect)
- Permanent carbon capture
- Aggregate Manufacture
- Reduce quarrying/dredging of virgin aggregates
- Support 100% recycling /recovery by EfW plants
- Potential to commercially capture CO<sub>2</sub> from Flue Gas
- Good Value APCr recycling.....



# Q, What is Good Value APCr Recycling ?

## A, Greener and Cheaper.

- Environment Agency Confirmed
  - “Concrete blocks made from Carbon8 Aggregate ... show no worse detriment to the environment or human health, than blocks made from virgin aggregate”.
- Current Proposal for 8000t/pa APCr producer;
  - Carbon8 process will save the operator in excess of £1.35m over next 5 years, against their current disposal option.



# Thank you

- Any questions?
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