

Advancing CO2 Utilization: Residue Carbon Capture Project



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Mud Spreading and Drying



The Raw
Material



Mud Flow Over
Drying Area



The Target Condition
High strength
Cracked and porous

Managing Drying of Mud Slurry



The usual result;

Atmospheric carbonation of surface liquor creates a crust containing $\text{NaAl}(\text{OH})_2 \cdot \text{CO}_3$, $\text{Al}(\text{OH})_3$ & Na_2CO_3

This slows the drying of the mud



The solution;
Capital & labour intensive ploughing

What is Residue Carbonation



Residue Carbonation involves the addition of CO_2 to thickened residue slurry

- Sodium hydroxide is converted to carbonates and bi-carbonates
- Alumina is precipitated as sodium alumino carbonate
- CO_2 reaction with the solids (conversion of residual lime to calcite and conversion of TCA to calcite and gibbsite)
- Overall result is a lowering of pH of the residue

Very good fit with the current process compared to other neutralisation options

- Doesn't introduce impurities, so closed water circuit can be maintained
- Utilises a waste product (CO_2) to treat the residue
- Provides a permanent sink for CO_2

Kwinana Carbon Capture Plant



CO₂ mixing tanks



Carbon Capture plant at Kwinana: Full Scale

Carbonation - The Results



- Improved drying
- Improved strength
- Less dusting

Outcomes Achieved



- **Environmental and Social Benefits of Carbon Capture**
- CO₂ – Sequestration: Kwinana system will lock up 70,000 tpa with residue: equivalent to removing 17,500 cars from the road)
- Partnership with neighbours: CSBP and BOC gases
- Lowering causticity of residue by 3 orders of magnitude: alkalinity similar to some natural soils (many benefits)
- Opens opportunities for re-use of the residue
- Defers capital for expanded drying areas through improved drying rates
- Significant reduction in dusting potential of stored residue
- Produces a biologically active “soil” – this opens opportunities for bio removal of organics

Future developments



- Potential linkage to State Government CCS Project (as a source of CO₂ for our Pinjarra and Wagerup refineries)
- Adoption of Carbon Capture opens the way for:
 - Bio removal of organics - now being implemented
 - Residue re-use (mud, sand, lime)
- Currently exploring residue filtration as an alternative solar drying of a slurry
 - This will dilute the business case for residue carbonation



Thank you