ABR Process Development

• ABR (Australian Bio-Refining) is an Australian based company headquartered in Brisbane, Queensland.
• ABR specializes in water remediation technologies for the removal & recovery of chemicals from processed wastewater.
• ABR has manufacturing & lab facilities in Brisbane and Melbourne, Victoria, plus has been operating in North America since late 2014.
Water Remediation Solutions

Contaminated & Toxic Water
IX Regen Acid Brine
RO Wastewater
Hydraulic Fracturing
Spent Pickle Liquor- Steel
Pregnant Leach Solutions- Mining
Landfill Leachates/Toxic Ponds

ABR Processes

Recoverable Solids
Clean Water

Reusable Chemicals
ABR Technologies

- Acid & Caustic Recovery Technology
  - Caustic Soda (NaOH)
  - Sorbent Powders
- Hydrochloric Acid (HCl)
- Sulfuric Acid (H2SO4)
- Phosphoric Acid (H3PO4)
- Heavy Metals Removal: Cu, Pb, Cd, Mn, Cr, Fe, Al, Zn, Tl & Hg
- Oxyanion Removal - As & Se
Conventional vs ABR Process

**Conventional Process Route**
- Brine stream for treatment
- Softening and RO Process
- HCl
- Inputs NaOH
- Process
- Reclaimed Water
- Brine Effluent
- Waste
- 25 Hectares Brine Effluent Storage

**ABR Process Route**
- Brine stream for treatment
- Softening and RO Process
- Brine Effluent
- HCl
- NaOH
- Process
- Reclaimed Water
- ABR Process
- Electricity
- Water

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Regenerating Acids & Caustics

Caustic Evaporator → ABR Cell

Sodium Hydroxide → Clean water → To RO or discharge

Feeds: Brine, SPL, PLS, etc

Hydrochloric acid

Acid Regeneration

Sulphuric acid

Zero Waste
ABR Electrochemical Cell

Anolyte Holding Tank - Closed Loop System

Initial Enriched Solution (HCl or H2SO4)

Catholyte Holding Tank - Brine or Wastewater

AX Membrane Only, So Metals PPTN At Cathode

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ABR Process Block Diagram for HCl

- **IX Columns**
  - Water In
  - Water Out
  - IX Regen Acid Brine
  - Electricity

- **ABR Cell**
  - H2(g)
  - Cl2(g)

- **HCl reactor**
  - HCl(ξ)

- **HCl Absorption**
  - 32% HCl (aq)

- **Solids removal**
  - CO2 (g) / NaCO3
  - Carbonate/Hydroxide Precipitates

- **Sodium/Potassium Removal**
  - NaOH/KOH Waste stream
  - Concentrate/Evaporate?

- **Return Feedwater**
  - Water makeup
Sorbent Powder for Metals - Results

ABR Media – Cation Removal Capacity Testing

- Jar tests with 0.25 g/L media in tap water for 1 week
- Cations at different concentration as per SOP
- Cd(NO₃)₃·8H₂O, K₂Cr₂O₇, CuSO₄·5H₂O, MnCl₂·4H₂O, Pb(NO₃)₂, and ZnSO₄·7H₂O as sources
Advantages

- ABR’s patented technologies do not have any direct competitors providing full recovery of acid, plus the ability to re-use the acid.

- Some environmental clean-up firms can remove the IX regenerated dirty acid by neutralizing & disposing of it. Some competitors can partially recover the acid.

- ABR’s technologies are 99% reliable based on basic maintenance. The lifespan of the ABR cell is 5-10 years & the anion exchange membranes are 18 to 24 months.
Design Model for Coal Seam Gas

**Nominal Brine Concentrate:**
- 400 m³ per hour
- ~16,000 ppm Cl
- ~15,000 ppm Na
- ~13,000 ppm Carbonate hardness
- TDS ~ 45,000 ppm

**Outputs:**
- ~ 160 t/d HCl (32%)
- ~ 275 t/d NaOH (45%)
- ~ 9 ML per day recovered water (TDS < 500 ppm)

**Market Imports:**
- 4.74 million Tons NaOH (45%)
- ~ $1.01B
- 4,216 Tons HCl (32%)
NORTH AMERICAN NETWORK

Resources

Academic

Research

Engineering

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