Thermal Treatment of Vacuum Residue Using Delayed Coking

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**Location:** Athabasca oil sands in Northeastern Alberta

**Capacity:** 2,300 barrels/day of Naphtha based on a 30,000 barrels/day VRC

**Innovation:** Amine Absorber-Regenerator System for Hydrogen Recovery

**Environmental Impact**
- Air Quality:
  - H₂ Recovery Unit → Vent gas
  - Furnaces → Flue gas
  - Fractionator → Wet gases
- Wastewater:
  - Sulfide = 14wt% → Sour Water Stripping
  - Treated water → recycled as Make-up Water
- Sulfur:
  - H₂S Rich Stream from Regenerator → Sour Water Stripping System and Sulfur Recovery Unit
- Greenhouse Gas:
  - Average = 17000 tonne of CO₂/yr

**The Process**
- Delayed Coking:
  - 2 Coke Drums and a Fractionator
  - Main Products:
    - Naphtha
    - Gas Oils
- Naphtha Hydrotreating:
  - Naphtha processed using H₂ to remove Sulphur impurities
  - Naphtha separated from Light Gases (H₂S rich)
- H₂ recycled back to the hydrotreater

**Amine Absorber-Regenerator**
- H₂S removed from Light Gases using Amine

**Economics**
- Annual Revenue: $240M
- Coke $41M
- Net Present Worth: $492M
- Naphtha $89M
- Light Gas Oil $42M
- Heavy Gas Oil $67M
- CAPEX $66M
- Delayed Coker Unit $20M
- Naphtha Hydrotreater Unit $21M
- Hydrogen Recovery Unit $25M
- OPEX $161M
- Raw Materials 76%
- Operating Supplies 2%
- Utilities 2%
- Operating Labor 11%
- Maintenance & Repair 5%
- Patents and Royalties 4%
- Rate of Return: 30%
- Project Lifetime: 20 years

**Plant Layout**

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