Flow Chart the Refining Process

Topic: Refining

Background Information:
The refining process occurs through a series of steps. Alcoa in Western Australia utilises the Bayer method for refining alumina.

What You Need To Do:
- Prepare a flow chart of the refining process
- What details can you add to make the flowchart more interesting

Extension/Alternatives
- Flowchart the mining and refining processes
- Flowchart the mining, refining and smelting process

Curriculum Links:
Science: Natural and Processed Materials
Society and Environment: Investigation, Communication & Participation, Resources
Alcoa operates a three-refinery system in WA – Kwinana, Pinjarra and Wagerup – between the capital city, Perth, and the port of Bunbury, 200 km to the south. The Bayer refining process, used by alumina refineries worldwide, involves four steps – digestion, clarification, precipitation and calcination – to extract alumina, the feedstock for aluminium smelters. Alumina is a white granular material, a little less coarse than table salt, and is technically called aluminium oxide. Aluminium does not naturally occur as a metal, but must first be refined from bauxite in its oxide form.

**Digestion**

Finely-ground bauxite (red in colour) is mixed with a hot caustic soda solution to dissolve the alumina from the bauxite. Every six tonnes of bauxite makes two tonnes of alumina.

**Clarification**

Insolubles, such as sand and mud, are settled and filtered out, leaving a solution of dissolved alumina hydrate.

**Precipitation**

The liquid containing alumina hydrate is then cooled in large open tanks and seed crystals added, causing the alumina to crystallise out of solution.

**Calcination**

The alumina hydrate is washed, then heated to remove water, leaving a pure dry alumina in the form of a fine white powder. This is cooled and stored, then shipped to smelters for processing.

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