

ATF-06-04—High Silica Bauxite Processing

Project

With the rapid development of the global alumina industry, bauxite consumption is growing and has reached more than 160 million tonnes per year. With such a high demand for bauxite alumina production is becoming more difficult due to the gradual global decline of high-grade bauxite resources.

There is a growing need to develop new processes and technologies for alumina production from low-grade bauxite with lower caustic and energy consumption in order to utilize available bauxite deposits.

Low-grade bauxite processing currently includes the application of sintering process, removing silica minerals from the bauxite by using either physical or chemical processes before the Bayer process etc. These technologies are limited by high capital costs, high energy consumption and have technological limitations.

This project focuses on developing technology for:

- Processing options—inhibiting either the dissolution of kaolin or the precipitation of desilica product (DSP), or forming an alternative DSP low in soda.
- Recovery of values from residues—reprocessing of residue or a concentrated DSP stream to recover soda, or produce a value added product to defray the cost of replacement soda.

Objectives

To develop new technologies and practices that are environmentally and economically viable for the processing of high silica bauxites to address the future demand for bauxite and the global decline of high grade bauxite resources.

Performance indicators

By 2010, participating countries will be able to process high silica bauxite for alumina production utilizing developed technologies. The ‘high silica bauxite’ means the ratio of alumina to silica in weight percentage in the bauxite is less than 8.

By 2015, 60% of participating alumina refinery facilities processing high silica bauxite operates in top 10% of the global benchmark performance for caustic soda and energy consumptions. The global benchmark would be:

- Determined from the industry surveys on the caustic and energy consumption in the refineries processing high silica bauxite all over the world.
- Related to the energy and caustic soda consumption per tonne of alumina production.

Milestones

- 2006–07 Determine bauxite sampling standards and chemical and mineralogical analysis standards of bauxite.
- Define the bauxite grades and ‘high silica bauxite’.
- Collect the typical high silica bauxite samples from different participating countries and carry out chemical and mineralogical analysis of the bauxite samples.
- Survey the practical alumina production from high silica bauxite in Partner countries and collect the energy and caustic soda consumption data as the basis for comparison.
- 2007–09 Cooperate on the research and development of a new project among Partner countries on finding the new types of DSP with favorable chemical and mineral compositions and crystal structures and their suitable formation conditions, based on the study of the bauxite’s mineral compositions and the behavior of impure minerals during bauxite digestion.
- Develop an improved Bayer process to produce alumina from high silica bauxite in which the new types of DSP with lower ratio of alumina to silica (A/S) and lower ratio of caustic soda to silica (N/S) can be formed to reduce caustic and energy consumptions in Bayer process.
- Select a suitable refinery for the case study of the project and implement the project in the refinery.
- 2009–10 Prepare, collate and disseminate project study results on implementation of projects by industry presentations/workshops and/or site visits to increase industry awareness of the opportunities to process high silica bauxite with low consumptions and cost.
- Apply the project achievements and newly developed process in some participating countries and Partner refineries using high silica bauxite as raw material.
- Collect the operation and consumption data in the alumina production facilities in Partner countries and compare to the original data collected at the project beginning.
- Complete and summarize the project implementation.
- 2010–15 Ongoing collection of data and reporting.

Resources

Information sharing on the methods and new process related to high silica bauxite processing with the cost as low as possible among the participating countries and organized by the project task force management.

Project identification, development and implementation by the companies supported by internal and external resources (including experts, research and industrial facilities etc).

Presentations, workshops, site visits and operation training hosted by participating companies and supported by industry experts to show the study data and results.

Participation

Australia, India and China.