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ETI RED MUD CHARACTERISTICS AND EVALUATION OF DEWATERING PERFORMANCE

Sedat Arslan, Havvanur Uçbeiyiay, Bekir Çelikel, Meral Baygül,
Seyit Avçu, Gökhan Küşrat Demir

Abstract

ETI Aluminium has a capacity to process 550,000 tons of bauxite, generates approximately 260,000 tons of red mud. Red mud slurry is disposed at 30 % (w/w) solids and less than 5 g/L Na₂O. ETI is focusing its efforts in maximizing extraction efficiency in digestion and improving precipitation yield of alumina. The red mud area is one of the most important topics that require serious study in terms of handling, recovery and environmental impact. A study has been conducted to determine red mud characterization with XRF, XRD, TG/DTA, IR, SEM/EDX, BET and PSD analysis. ETI might face red mud disposal area problems in the following years. ETI has initiated a fast track program towards the improvement of the dewatering performance of red mud and increase disposal area life time. ETI has been closely investigated dewatering technologies to select most appropriate one.

Introduction

Red mud handling is one of the most critical issues in an alumina refining process that affects overall economics of a Bayer plant operation, and involves a relevant environmental issue related to the tailings disposal. The first step is to achieve high efficiency in solid liquid separation that can determine plant flow, liquor productivity, product quality and caustic losses. Second, the management of this high quantity of pH waste product that gives issues raised on storage and environmental problems.

ETI Aluminium has disposed about 6,702,058 tons of red mud on yearly basis since 1973. The red mud lake which has 10 million m³ capacity has been currently almost filled up. Although 6 millions m² extra capacity is available in another lake, it seems appropriate to consider some investment either for a new dam or a dewatering technology in ten years, considering the same production capacity and climate conditions in this region.

The present paper describes the physical, chemical and mineralogical characteristics of ETI Aluminium red mud. Mud rheology and filterability tests will also be discussed. ETI has initiated a fast track program towards the improvement of the dewatering performance of red mud and increase disposal area life time. ETI has been closely investigated dewatering technologies to select most appropriate one.

Evaluation of Applications For The Best Red Mud Dewatering Performance

Another objective of this study has been to undertake determining the most appropriate red mud dewatering technologies that will be needed in the nearest future at ETI Aluminium. Currently, the solid content from conventional last washer thickener is about 30 % (w/w) before red mud is pumped to the pond. The most important issue to extend life time of the current red mud disposal area is to bring down moisture level of red mud slurry. From latest technological paste thickening application point of view, in the range of 33 to 40 % solids in the underflow seem achievable with the existing ETI Aluminium red mud characteristic.

Also using vacuum filtration and centrifugal decanter technology, the achievable cake solids content is around 47% and 55% respectively. However, higher red mud cake solids like 70% is required to prevent any undesired disposal area issues and environmental concerns, therefore different waste dewatering applications like vacuum filtration, filter press, centrifugal decanter, etc. need to be taken into consideration.

ETI Red Mud Physical and Chemical Analyses

Red mud semi quantitative elemental analysis was done ARL Advant’x 2008 Quantax and shown at Table 1. The main phases found are hematite and silica containing minerals shown at Table 2. XRD analyses are supported with XRF analyses.

Table 1: Element Analysis of Red Mud (w/w %)

Table 2: Mineral Phases in Red Mud

Conclusions

- Current red mud product can be dewatered with the mentioned filter press technologies.
- Reduce the disposal area required for red mud storage
- Minimize the potential for liquor release to the surrounding environment
- Maximize the recovery of the caustic rich liquor to the plant
- Reduce the consumption natural source water during red mud washing process
- Thus this study will enable the development of best practice red mud dewatering process options to reduce the reliance on disposal area and make storage more environmentally acceptable.

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