

New Bauxite - Testing Protocol

Eoin Keane

Senior Process Engineer

Aughinish Alumina Ltd., Askeaton, County Limerick, Ireland

Corresponding author: eoin.keane@augh.com

Abstract



The Rusal Aughinish Alumina (AAL) refinery is located on Aughinish Island, on the southern shore of the Shannon Estuary 33 kilometres west of Limerick city in the South West of Ireland. The plant, which commenced operation in 1983, has a current production capability of 1.99mt/yr. It sources bauxite predominantly from Guinea, Brazil and Guyana and uses the Bayer process to produce Alumina. The refinery functions with an accredited Safety Management System (ISRS), Environmental Management system (ISO14001), Quality Management System (ISO9001) and Energy Management system (ISO50001). The AAL Research Group established a protocol for the evaluation of new bauxite supplies. The protocol is used to identify potential issues with processing a new bauxite at AAL or other refineries. It includes a review of the materials handling and slurry properties, alumina extraction at high and low temperature, mud settling and the impurities balance. This paper outlines the steps in the protocol and how the results have matched performance of the bauxites at refinery scale.

Keywords: Alumina refinery, Bauxite testing.

1. Introduction

The AAL refinery was commissioned in 1983 and designed to process a specific blend of dried bauxite.

Over the years, the refinery has seen significant increases in production through innovative debottlenecking projects. In recent years, due to decreasing bauxite quality and increasing cost, AAL Research Group have developed test protocols to evaluate alternative bauxite supplies. The protocols introduce a systematic and comprehensive approach to evaluating a new bauxite blend through Test Work, Simulation, Reviews and Economic Estimation.

AAL also support other refineries in the Rusal group with Bauxite testing.

2. Bauxite Testing Protocol

The bauxite testing protocol starts with standard tests and then moves to more specific tests to understand the impact on the refinery. An overview of the bauxite testing protocol is shown in Figure 1.

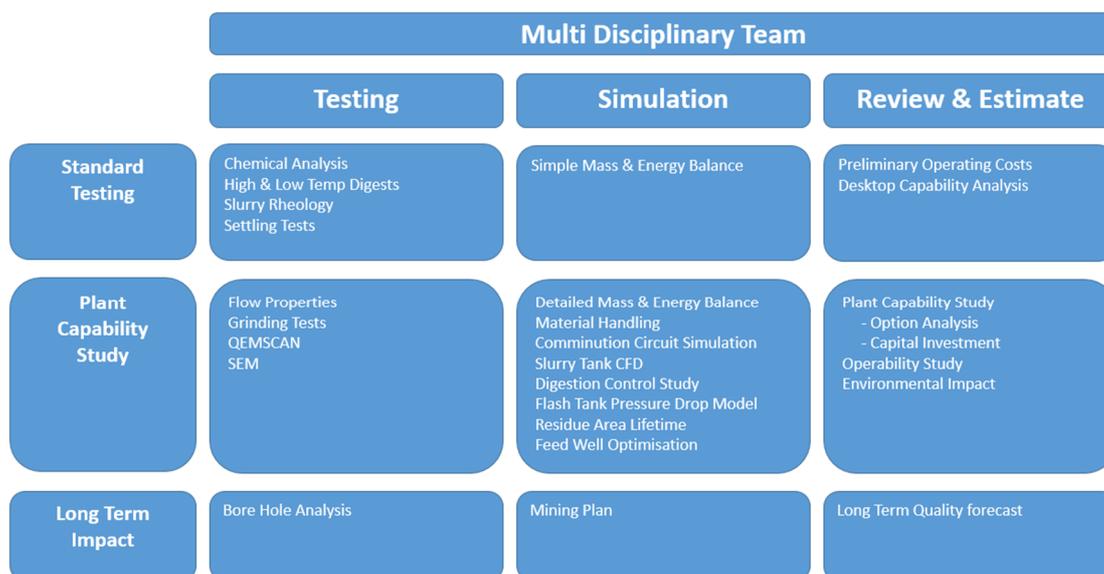


Figure 1. Bauxite Testing Protocol.

2.1. Standard Testing

The starting point to evaluate a new bauxite is the standard test stage. The standard tests include chemical analysis, slurry rheology, bomb/autoclave digest and settling tests. This first level of testing allows a quick screening of the bauxite. The test data is recorded and gives a simple comparison of the various bauxite types.

The tests provide enough information to develop a simple mass and energy balance. A desktop capability analysis and a preliminary economic model are then developed and this allows an initial screening of the economic viability and production rate capability.

2.2. Plant Capability Testing

The plant capability tests provide the detailed information required for the plant capability study. These tests include but are not limited to flow properties, grinding tests, digestion studies and QEMSCAN.

Simulations are then used to predict the impact that the change in bauxite supply will have on the refinery. The simulations incorporate many years of operating experience and allow the engineer to objectively and comprehensively evaluate a new bauxite supply.

The testing and simulation work carried out as part of the plant capability study allow a detailed plant capability study to be prepared. This study is carried out by a multi-disciplinary team who can accurately evaluate the impact on refinery equipment. The study includes an option analysis and capital requirement for the options. The environmental impact of the proposed options are also reviewed at this stage.

2.3. Long Term Impact

In parallel to the plant capability study, the long term impact of the new bauxite supply is evaluated. This includes reviews of mining plans and quality forecast of the mine.

5. Conclusions

The success of the bauxite testing protocol is in the utilization of an experienced multi-functional team capable of accurately simulating and evaluating the impact of a new bauxite supply. At AAL the study is led by the Research Group who are located on site and integrated with the operations team.

Laboratory testing is carried out by the Research laboratory analysts which allows for prompt and correct interpretation of the results and ensures the accuracy. The AAL Research Group also have the expertise onsite to develop the various simulation required for a successful evaluation. An experienced operations team allows the practical feasibility of options to be evaluated.

In addition to this in house capability, AAL utilizes external resources such as the University of Limerick. This ensures that the Research Group remain up to date with testing, modeling and simulation techniques.