

Performance Optimization of Froth Flotation Process using Response Surface Methodology

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Abstract

Owing to the high ash content, Indian coking coals are considered to be of sub-optimal quality. Thus, the coals need to undergo beneficiation prior to their utilization in the steel industry. The froth flotation process is a universally accepted physico-chemical process for the beneficiation of coal fines.

Due to increased mechanization of open cast mines, the quantity of coal fines generated has increased drastically. All the flotation circuits in the present washeries are finding it difficult to adjust the process variables due to wide fluctuations in the fines content. Keeping in view the above observations, process variables such as collector oil dosages, frother oil dosages and pulp density need to be optimized for getting maximum yield at the specified ash level.

Response surface methodology (RSM) is a collection of statistical and mathematical techniques useful for developing, improving and optimizing different processes. It has also important applications in the design, development and formulation of new products as well as in the improvement of existing product design.

In the present study, the effect of variables such as collector oil, frother oil and pulp density on the flotation characteristics of the coal has been investigated. Statistically designed experiments are used to determine variables that affect the product characteristics more significantly. In the present work, attempts have also been made to optimize the process by using response surface optimization techniques.