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A Comprehensive Study to Understand the Role of Process Parameters in Jigging

A.K. Mukherjee[1] and **B.K. Mishra**[2]

[1] *R&D Division Tata Steel, Jamshedpur - 831 007, India*
[2] *Indian Institute of Technology Kanpur, Kanpur – 208 016, India*

Abstract

There are three important process parameters for jigging. These are amplitude of pulsation, frequency of pulsation, and feed characteristic. The role of these parameters is explained by viewing the jig operation as a repetitive process of fluidization and defluidization and assuming that the fluidization state of each jig cycle controls the particle segregation.

Amplitude of the water pulsation decides the water velocity through the jig bed. Unlike normal fluidization the water velocity in a jig cycle varies with time and the rate of change of water velocity plays a key role in particle segregation. Maximum water velocity in a jig cycle limit the rate of change of water velocity and is a characteristic of the jig cycle. Effect of maximum water velocity on jigging performance is studied in detail. The results show that a coarse feed needs higher maximum water velocity and the coarser fraction of any feed separtes better at any higher maximum water velocity compared to other size fractions.

The effect of frequency on particle segregation is studied by considering the particles in the jig beds as tuned mass dampers and the water as a separate vibratory system. The analogy indicates that for better separation a coarser feed needs higher frequency of water pulsation and a finer feed needs lower frequency of water pulsation.

Role of feed characteristic on fluidization is studied extensively using binary system of particles. Feed characteristic of a binary system in the context of fluidization is defined through several important parameters like size ratio, density ratio, volume fraction and particle size. Effect of these parameters on particle segregation is established. Test results show that the size ratio favourable for particle segregation is a function of density ratio. A feed with favourable size ratio containing higher volume fraction of fines is ideal for jigging.