Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Computational and experimental studies of the flow, mixing, and size segregation phenomena of heterogeneous granular materials MASATO R. NAKAMURA, ITOCHU Technology Inc., MARCO J. CASTALDI, NICKOLAS J. THEMELIS, Columbia University — Flow, mixing, and size segregation of heterogeneous granular particles are intriguing phenomena. In order to characterize the behavior of heterogeneous particle, a two-dimensional stochastic model of particle flow and mixing within the packed bed on a traveling grate was developed. The model was calibrated and validated by means of a physical model of the reverse acting grate, using tracer particles ranging from 6 – 22 cm in diameter. It was found that the motion of the traveling grate, whose speed ranged from 15 to 90 reciprocations/hr, increases the mean residence time of small and medium particles by 69% and 8%, respectively, while decreasing the mean residence time of large particles by 19%. This is because of size segregation known as the Brazil Nut Effect. When the ratio of particle diameter to the height of moving bar, d/h, increases from 0.46 to 1.69, the mixing diffusion coefficient, De at 60/hr., decreases from 96 to 38.4. This indicates that the height of the moving bars should be greater than the diameter of targeted particles.

Masato R. Nakamura
ITOCHU Technology Inc.

Date submitted: 06 Aug 2008 Electronic form version 1.4