Accepted Manuscript

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PII:	S0032-5910(18)30761-7
DOI:	doi:10.1016/j.powtec.2018.09.033
Reference:	PTEC 13707
To appear in:	Powder Technology
Received date:	13 April 2018

Received date:13 April 2018Revised date:10 September 2018Accepted date:14 September 2018

Please cite this article as: Yu Liu, Andrew Thomas Cameron, Marcial Gonzalez, Carl Wassgren, Modeling granular material blending in a Tote blender using a finite element method and advection-diffusion equation multi-scale model. Ptec (2018), doi:10.1016/j.powtec.2018.09.033

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Modeling granular material blending in a Tote blender using a finite element method and advection-diffusion equation multi-scale model

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Abstract

A multi-scale model is presented for predicting the magnitude and rate of powder mixing in a Tote blender. The model combines particle diffusion correlations calibrated from experiments with transient advective flow field information from finite element method simulations. Predictions of the mixing rate from the multi-scale model compare well quantitatively to published experimental data for side-side and top-bottom loading conditions. The multi-scale model, since it does not directly model individual particles, is expected to scale well to systems of industrial interest.

Keywords: Blending; Granular material; Finite element method; Multi-scale model

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