Effect of impeller geometry on dry powder flow dynamics

W. Goh*, M. Ghadiri*,[1], F. Muller*, K. Sinha†, N. Nere†, R. Ho†, S. Bordawekar† and A. Sheikh†

* School of Chemical and Process Engineering
University of Leeds
Leeds, LS2 9JT, United Kingdom
[1]Corresponding Author: M.Ghadiri@leeds.ac.uk

† Process Research and Development
AbbVie Inc., 1 North Waukegan Road
North Chicago, Illinois 60064, United States

ABSTRACT

In a number of unit operations involving particulate solids, such as agitated filter bed dryers and dry powder mixing by a rotating impeller system, particle flow pattern is strongly affected by the impeller geometry. We explore two common impeller geometry designs, FT4 and a scaled-down version of an impeller commonly used in agitated filter bed drying, and evaluate their induced patterns of flow. We report on our work on analysing the stress distribution along the blades of the two impeller designs by discrete element method (DEM) using ROCKY software (ESSS, Florianópolis, Brazil). Powder bed dynamics for a range of impeller tip speeds are evaluated and correlated to the input work, which is a measure of the powder bed resistance to flow in a dynamic state. The efficiency of particle mixing, which is an indirect measurement of homogeneity (relevant to heat transfer and mixing within a particle bed), is also investigated for both impeller designs and will be presented.

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