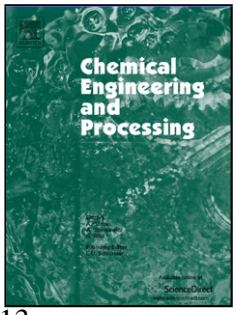

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PII: S0255-2701(14)00176-7
DOI: http://dx.doi.org/doi:10.1016/j.cep.2014.08.013
Reference: CEP 6466

To appear in: *Chemical Engineering and Processing*

Received date: 22-1-2014
Revised date: 7-7-2014
Accepted date: 31-8-2014

Please cite this article as: Juray DE WILDE, Gas-solid fluidized beds in vortex chambers, Chemical Engineering and Processing http://dx.doi.org/10.1016/j.cep.2014.08.013

Gas-solid fluidized beds in vortex chambers

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Abstract

This review deals with gas-solid fluidized beds in vortex chambers. High-G fluidization can be achieved in a static geometry and allows significant process intensification. Thin, dense and more uniform particle beds can be obtained at high gas-solid slip velocities, intensifying interfacial transfer of mass, heat and momentum and reducing the gas-solid contact time. Existing fluidized bed processes can be carried out more efficiently and novel processing routes can be developed, e.g. involving cohesive particles or a dispersed liquid phase in relatively high concentrations.

A first section of the review discusses the unique hydrodynamic characteristics of gas-solid fluidized beds in vortex chambers. The flow pattern, flexibility in the operating conditions and stability conditions are explained.

The design of vortex chambers is dealt with in a second section and is critical for processing both larger and fine particles. The influence of the gas and solids in- and outlet design is focused on and insight is gained from recent theoretical, experimental and CFD studies.

In a third section, (potential) applications are discussed and process intensification and novel processing routes demonstrated. A fourth and last section presents extensions of the concept. Multi-zone operation and the integration of other technologies in vortex chambers are considered.

Keywords: a