# Hydrodynamics modeling of corn drying in a triangular spouted bed dryer

**W.B. Bie, G. Srzednicki, D.F. Fletcher**

Acta Horticulturae 1011: 169-178. 2013.

## Abstract

Drying is one of the oldest methods of food preservation and an established postharvest process. In grain drying, drying efficiency is always balanced with the quality of the product. Spouted Bed Dryer (SBD) is a dryer that inherently had a tempering process that enables the use of high temperature with minimal product deterioration. However, the complexity of its hydrodynamics raises difficulty in scaling up process and thus hindering a wide-spread adaptation of the dryer commercially. As the computation power grows, Computational Fluid Dynamics (CFD) model of SBD has been championed as a possible tool to assist in scaling up and performance studies. A triangular SBD with a draft plate is chosen as dryer and corn as the drying material. A multiphase Eulerian model is developed with the secondary phase defined as granular flow and additional closure was given by the adoption of the kinetic theory of granular flow. The turbulence is modelled using realizable k-$\varepsilon$ model. The geometry of the dryer is simplified into 2D axisymmetric to enable a 2D simulation. This study will focus on the hydrodynamics inside the dryer to ensure the design will enable a recirculation flow. The model is then used to predict the recirculation rate, the fountain height and the pressure at the inlet area which will be use to decide the opening height, the insert height and the appropriate fan for the dryer in design stage. The result will be validated with data collected from a pilot scale triangular SBD. It is expected that the CFD simulation model will provide a significant assistance in designing and optimising the operation of the triangular SBD. This dryer type has a very good potential to be used for drying of high moisture grain, especially in the wet tropical regions.