



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Thermal and Hydrodynamic Studies of a Rotating Fluidized Bed Dryer with Static Geometry**

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SHORT ABSTRACT

Lack of supply of good quality food worldwide is a major problem from the point of view of imbalance in production and consumption. Post-harvest losses in developing countries have reached 10%, and food preservation is the only way to reduce food losses. Drying of food is an essential energy-intensive technique to reduce damage to the product and increases its shelf-life by inhibiting the growth of enzymatic reactions, microorganisms, and other deteriorating reactions. Most dryers available in the literature are low-efficient and requires large space. The fluidized bed technique is one of the emerging drying techniques that reduces the drying time, by maintaining the product quality and nutritional value. However, conventional fluidized beds are well-performing dryers and have been in use for many years. Nevertheless, few demerits such as large in size, expensive, need for rotating seal, difficulty in solid loading, and unloading during the operation were incorporated with these dryers. All the drawbacks of traditional fluidized beds were eliminated in the recently developed rotary fluidized-bed (RFB) dryer. Nevertheless, few demerits of RFBs such as vibration during operation, wear-tear of moving elements, and particle breakage reduce their significance. To minimize the demerits of RFBs, an innovative technique of a RFB dryer with static geometry was reported. Though RFB-SG dryers have salient features, there is a need to increase system capacity at the commercial level, which is quite difficult due to system complexity. The present research is focused on the development and performance analysis of a rotating fluidized-bed dryer with static geometry (RFB-SG) without slit. In the present study, the performance of the RFB-SG dryer with and without slit has been evaluated

experimentally numerically. Further, the experimental results of the RFB-SG dryer without slit and RFB-SG dryer with slit are compared. For the drying of 400 g paddy at the operating temperature of 338 K, and air flowrate of 600 m³/h the drying efficiency of the RFB-SG dryer without slit is found to be 20.45% higher than RFB-SG dryer with slit. Also, numerical findings of RFB-SG unit without slit were experimentally validated. Based on the experimental results, the scale-up of the best performing laboratory level RFB-SG unit without slit has been carried out for the solid loading capacity of 3370 g.

