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Value Addition of Food in Drying Process: Design & Development of an Enhanced Food Dryer with Uniform Heat/Air Distribution

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Abstract

This work focuses on the quality drying of food. Drying of a product is not an issue but to get a highly qualitative dried product quantitatively in farmer communities is a challenging task. These farmers dry food products in open sun drying (deteriorate quality), in small conventional dryers *i.e.* solar and biomass which are unable to contribute the society due to low drying capacity and low quality (due to uncontrolled drying conditions). High quality food drying requires two tricky things, consistent heat and uniform air distribution. Air drying is low-cost and high-speed, but expose the food being dried to high levels of uneven heat, reducing the quality of the overall product substantially by over and under drying. A new medium scale hybrid dryer has been developed with diagonally air flow pattern to establish uniform air distribution over the entire length (11 m) of dryer. It will strengthen the common assumption of isothermal condition in drying process which can be applied to deal drying modelling, where non-isothermal conditions are commonly taken.

Ansys-workbench13 (FLUENT) has been used to assess the working behaviour of proposed design. Design modelling and simulation have been done in both 2D and 3D format. Sample calculations are made for drying wood pieces as an illustration of the principle outlined. It has been estimated that how even temperature distribution avoids over & under drying problems with uniform drying rate. An amount of 0.327 ton wood was dried at controlled temperature of 44°C for 96 hrs. These samples were put in plastic buckets along the length of dryer. The measured temperature distribution and uniform drying rate of all wood samples illustrated the success of the design. Next experimentation will start for food (fruits & vegetables) to assess the uniformity of defined quality parameters.

Keywords: Air distribution, quality food drying, value addition

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