

Performance and Experimental Studies on vortex circulating Double tube solar passive-Bed Dryer- Review

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Abstract- Drying using solar radiation, i.e. drying direct sunlight, is one of the oldest techniques used by mankind to preserve agriculture based food and non-food products. This form of energy is free, renewable and abundant in any part of the world specially in tropical countries. However, in order to maximize its advantages and optimize the efficiency of drying using solar radiation, appropriate technology need to be applied order to keep this technique a sustainable one. Such technology is known as solar drying and is becoming a popular option to replace mechanical thermal dryers owing to the high cost of fossil fuels which is growing in demand but dwindling in supply. Various topics in sun and solar drying are discussed in many scientific reports, research manuscripts and books. This project will be fabricating and testing for drying agriculture produce by using flat plate collector and vortex circulating bed. The model can predict the change in absolute humidity of air across the bed, the temperature of air, the moisture content and the dryer thermal efficiency. By using vortex circulating bed, efficiency is increase and reduces the time for drying.

Index Terms- vortex circulating bed, absolute humidity, moisture content, layer thickness, resident time, dryer thermal efficiency.

1. INTRODUCTION

The solar dryer consists of flat plate collector, an insulated blower with pipe connections, and vortex circulating bed. The flat plate collector is use to circulate the hot air from the collector to the bed. A rubber bellows is use to connect the blower outlet with the dryer inlet and keep the blower free from vortex circulating motion of the bed.

In this vortex circulating bed technique is use, where the bed of the solar dryer is circulating while drying chilies that are continuously fed, this model to predict the change of the air temperature and the change in the absolute humidity and the efficiency of the dryer. By using the vortex circulating bed the resident time

of the chilies or agricultural produce can be increases with hot air so that it can dry rapidly. Equal amount of heat is supply to all chilies and time taken by agricultural produce can be reduces, efficiency of the dryer is increase.

2. PROBLEM DEFINITION

In previous so many work had done on solar dryer by using path method. The moisture is manually decreasing by circulating dryer circularly.

In this model, in my work, I will use two path solar dryer that's why enhance the efficiency comparatively more than single path solar dryer.

3. OBJECTIVES

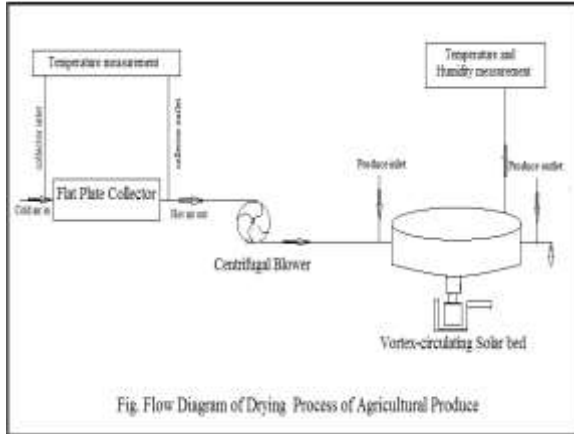
In earlier studies the sunflower seeds are dried through either a fixed bed or continuous flow bed technique. A large number of researcher's have reported cross-flow dryer modeling. The models consider the void fraction and the transient air-drying condition within the bed neglected.

In our present study we are going to implement a new technique in solar dryer bed with vortex circular motion. By using this concept drying performance of the product will increase without affecting output seed quality parameters such as germination, oil content, protein content, free fatty acid content, peroxide value, and seed color.

- Enhancement in less specific energy consumption and more moisture removal
- Increase the efficiency of solar dryer by use of vortex circulating bed.
- Circular vortex motion technique provide efficient agitation and moisture removal of product
- Achieve the uniform drying and reduce the over drying of food products

4. RESEARCH METHODOLOGY TO BE EMPLOYED

The solar dryer system consists of a flat plate collector, an insulated blower with pipe connections, and vortex circulating-bed. The flat plate collector is used to heat the ambient air into hot air. The blower is used to circulate the hot air from the collector to the bed. A rubber bellows is used to connect the blower outlet with the dryer inlet and keep the blower free from the vortex circulating motion of the bed. The chillies are fed from the feeder at one end of the bed and are spread over the bed as a thin layer due to bed circulation. The advantage of the vortex circulating bed is to provide constant movement of the chillies over the bed in order to enhance the resident time with hot air.



The moisture present in the bottom surface of the chillies is evaporated first because of the hot air contact; after that, the chillies themselves are rotated because of the vortex motion of circulating bed. The hot air entering the bed with a low relative humidity and high temperature picks up the moisture from the chillies and leaves the bed with a high relative humidity and a low temperature. In order to improve the drying performance of the solar dryer, on an hourly basis, the reflective mirrors and the bed cover will be propose to be use on the model. By using the vortex circular bed the resident time of the chillies or agricultural produce can be increases with hot air so that it can dry rapidly. Equal amount of energy is supply to all chillies and time taken by agricultural produce can be reduces, efficiency of the dryer is increase.[7]

5. BENEFITS OF MODIFIED DESIGN

Food preservation: Although it is undeniably important to increase the major yield of major crops in many developing countries, an even greater increase in the amount of food available for human consumption could be realized by using appropriate food preservation methods.

Grain drying: Cereal grains are usually harvested at moisture content too high for safe storage. Thus drying is a necessity.

A large amount of moisture has to be removed from wet grain to ensure that safe moisture content is achieved.

This will reduce the rate of bacterial and fungal activity on the grains.

Drying has one of the widest applications in both chemical and agricultural industries taking up a substantial percentage of annual investment in these industries.

6. FUTURE SCOPE

- The present work can be extended by arranging copper tube to the side walls of dryer to recover heat from the side walls.
- Dairy industries, Food processing industries, Textile industries can be use solar dryer for several applications.

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