Design of Solar Power Based Agricultural Dryer

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Abstract

Solar drying is an important way of resolving the world food issue includes reducing food losses that occur because of a variety of factors such as the absence of adequate technology, unsuitable crop and fertilization, absence of marketing routes, inappropriate transportation, heavy post-growth losses, etc. The only way to decrease food loss has been through solar drying and conservation since centuries (M.V. Ramana Murthy, 2008). Several kinds of solar dryers were developed to solve this issue.The dryer type relies on the product and the method of drying needed for that specific product type. The drying process mainly involves the migration of water to the surrounding area from the inside of the dried product and is therefore a phenomenon of heat and mass transfer (P.Barnwal et al., 2008). A significant parameter determining the heat and mass transfer is the convective heat transfer coefficient. The coefficient of convective heat transfer differs from one crop to another and the drying mode ranges from 1.31 W / m2 K for green chilies (Anwar and al., 2001a, b). The fundamental substance of a desiccation is to decrease the product's humidity content to a point that prevents the damage in a certain time period.Drying is a dual process of -heat transfer to the product from the heating source. And mass transfer of moisture from the interior of the product to its surface and from the surface to the surrounding air (O.V Ekechukwu et al1999).

Keywords-convective heat transfer, concurrent heating, solar dryers

INTRODUCTION

Drying is described by concurrent heating and mass transfer as a method for moisture removal. It is a classical way of preserving food, providing longer shelf lights and little storage space. The method of drying is carried out in two steps. The first phase occurs at continuous drying speed on the drying material's surface and is comparable to water vaporization in the atmosphere.The second phase occurs with a declining drying rate (dropping). The situation of the second phase is based on the characteristics of the dried material[1]–[9]. Open sun drying is the most widely used technique for preserving farm goods in most developing nations like grains, fruit and vegetables.This kind of drying is causing serious losses in the amount and quality of the dried item under harsher climatic circumstances. The losses were linked to the contamination of insects, rodents and livestock by dirt, dust and infestation. The implementation of solar dryers in developing nations can therefore decrease plant loss and considerably enhance dried product quality relative to traditional drying techniques, such as sun drying or drying with shade.In order to dry the products most of these solar dryers use direct solar radiation. In this project, we aim to focus the thermal radiation on the surface of highly conductive material such as copper sheet that

leads the heat. Furthermore, the heat is trapped in the convection and radiation processes for drying the goods.

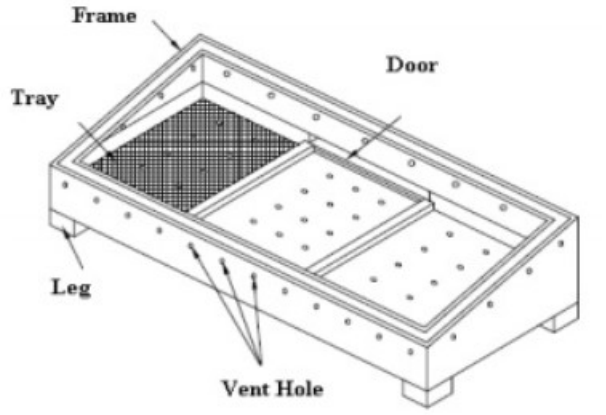

Fig. 1 Solar Cabinet Dryer Developed by Brace Institute

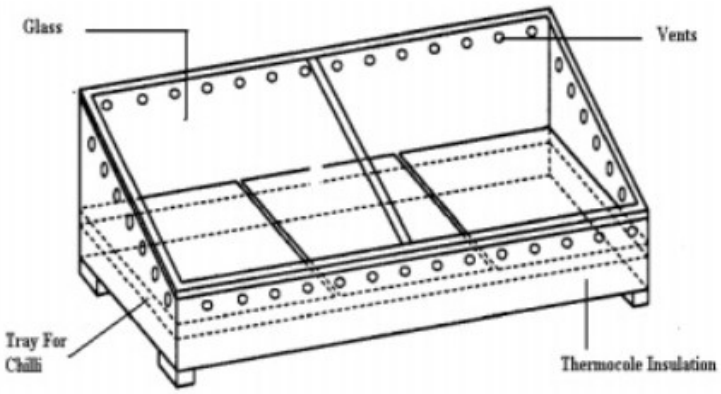

Fig. 2 Natural Convection Solar Cabinet Dryer

RESULT AND CONCLUSION

The solar powered based agricultural dryer with lens assembly and drying chamber was successfully designed and manufactured. The dryer was made completely solar based by replacing hand operated fan system to solar panel powered electric fan. The drying capacity and efficiency was determined by collecting different drying properties.

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