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Realization of a Solar Dryer Assisted by a Parabolic Concentrator

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Abstract

The present study aims to achieve an indirect solar dryer for agro-food products from the Oued-Souf region (South-East of Algeria). The dryer produced is assisted by a parabolic concentrator to improve its performance, such as temperature and drying time. An application of this device on the potato gives very encouraging results, such that the temperature in the drying chamber is reached intoxicating 60 ° C with a drying time of 3 h. A perspective and continuity of this work, by improving this dryer by adding instruments to it to be able to measure continuously, also the integration of phase change materials for drying at night. This device will therefore be the subject of a drying unit on which we can perform efficient solar drying tests in the future.

Keywords: solar drying, solar collector, parabolic concentrator, drying kinetics, water content, tracking system.

1. Introduction

Drying is a process of extracting water from a solid, semi-solid or liquid by evaporation. This operation requires a heat source. Several techniques are possible for drying and preserving crops: drying in the field in the sun, dehydrating booths, silage for fodder and drying in racks [1].

The region of El Oued has known many agricultural crops which constitute a source of life for the Algerian population, among these, We find the agriculture of tomato, Potato, Pepper and peanut etc. This product is harvested in late fall. With large quantities and lack of drying means.

It had become difficult for the farmer to dry them by traditional methods (Under the heat of the sun) hence the search for other methods more effective and less expensive, Also faster than the traditional way which requires labor and time (15 days), Significant crop losses result from inadequate drying, fungal attacks, insects, encroachment by birds and rodents, unexpected rain and other effects of the weather.

A great deal of research has been done on direct, indirect and mixed solar drying systems, to replace traditional systems and improve their efficiency [1-3].

In this work, we present an indirect solar drier assisted by a parabolic concentrator in order to bring possible performance improvements specific to the region where it is installed (El-Oued, South-East of Algeria).

2. Dryer Realization

The indirect solar drier (Figure.1) essentially consists of two parts: upstream a collector formed by a parabolic concentrator which converts solar radiation into thermal energy where the drying air is heated in a metallic envelope placed in the focal point. The air rises by forced convection using a fan to the drying chamber containing the product to be dried where a heat transfer from the air to the product and a mass transfer from the product to the air occur during the course of the heat transfer fluid.

3. Conclusion

A prototype of solar dryer assisted by parabolic concentrator was studied. This study allowed us to know the functioning and the performances of the presented system.

The use of parabolic concentrator leads to improve the performance of the drying process such as the drying temperature, increase in the product quantities to be dried and drying time.

The experience is to be considered largely positive regarding the understanding of the model and the knowledge of the method of construction of a solar drier assisted by a parabolic concentrator.

Figure.1séchoir solaire assisté par un concentrateur parabolique

Figure.2 Le Récepteur

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