IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

State Level Conference – AITCON 2K24

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 11, Special Issue 1, March 2024

Review of Solar Dryer

Kunal Ravindra Manole[1], Krishna Mahadev Kore[2], Arbaj Nisar Balekhan[3], Manish Dipak Kamble[4], Adarsh Ananda Kamble[5], Prof. V.M. Heralge[6]

Diploma, Electrical Engineering, DKTE's YCP ICHALKARANJI, Ichalkaranji, India[1-5]

B. E, Electrical Engineering, DKTE's YCP ICHALKARANJI, Ichalkaranji, India[6]

Abstract: The solar drying system utilizes solar energy to heat up air and to dry any food substance loaded, which is beneficial in reducing wastage of agricultural product and helps in preservation of agricultural product. Based on the limitations of the natural sun drying e.g. exposure to direct sunlight, liability to pests and rodents lack of proper monitoring, and the escalated cost of the mechanical dryer, a solar is therefore developed to cater for this limitation. This project presents the design and construction of a domestic passive solar dryer. The dryer is composed of solar collector (air heater) and a solar drying chamber constraining rack of three cloth (net) trays both being integrated together. The air allowed in through air inlet is heated up in the solar collector and channeled through the drying chamber where it is utilized in drying. The design was based on the geographical location which is Abeokuta and meteorological data were obtained for proper design specification.

Keywords*:* Solar cleaner, cleaner Project, Dryer Project, Solar Dryer project.

I. INTRODUCTION

Solar Drying, in the context of agriculture, refers to the process of removing moisture from crops. After harvest, a crop will have inherent moisture that it accumulated during the growth phase. The moisture creates a favorable environment for microbial activity, which at the very least reduces the possible storage time, and at worst, leads to the spoilage of the crops rendering them unfit for consumption. Drying removes this moisture inherent in crops after harvesting, thereby increasing the crops' storage life. However, the process of drying varies, depending on a range of factors that include the crop, preferred technology, desired drying range, and even the budget. This write-up will focus on solar drying as this is the most widely adopted form of drying in Africa. To that end, there are two main practices of solar drying in Africa- Open sun drying and solar drying.

II. LITRATURE SURVEY

- Solar drying is a sustainable and efficient method of drying agricultural products that has been gaining popularity in recent years. Numerous studies have been conducted on solar dryers, and their results have shown that they can provide high-quality drying while reducing labour costs and energy consumption.

- One study conducted by Singh and Tiwari (2007) developed a natural convection solar dryer for drying grapes. The system used a solar collector and a drying chamber, and the drying process was controlled using temperature and humidity sensors. The results showed that the solar dryer reduced the drying time and improved the quality of the dried grapes compared to sun drying. In recent years, the use of microcontrollers such as Arduino has become popular in the development of solar dryers. Arduino microcontrollers provide a cost-effective and easy-to-use platform for controlling and monitoring the drying process.One study by Srinivasan and Sangeetha (2016) developed a solar dryer using Arduino for drying mushrooms. The system used a temperature and humidity sensor for monitoring the drying process, and a fan for efficient drying. The results showed that the solar dryer reduced the drying time and improved the product quality compared to traditional drying methods.

- Overall, the literature review suggests that solar dryers, particularly those incorporating microcontrollers such as Arduino, provide a sustainable and efficient method of drying agricultural products. These systems have the potential to reduce labour costs, improve product quality, and contribute to environmental sustainability

III. METHODOLOGY

The chamber design needs the temperature controlled throughout the drying process. Under drying cases fungal inspection & bacterial action, thus main objective is design the solar dryer tunnel & design circuit to control various drying parameters inside it.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

State Level Conference – AITCON 2K24

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 11, Special Issue 1, March 2024

- **TYPES OF DRYING METHOD**

The two types of solar dryers are passive and active mode. Direct and indirect types can further be separated into passive dryers. The temperature of the box dryer is raised by reflecting radiations. In an indirect solar dryer, hot air in the dryer chamber is heated using a collectors or preheater instead of sunlight directly hitting the article being dried. Natural convection, which is what passive dryers are, occurs when there are changes in fluid density brought on by temperature gradients. They are easily buildable with cheap, locally obtainable materials. This is a quick and affordable way to store food for an extended period of time

- Solar Dryer Tunnel:-

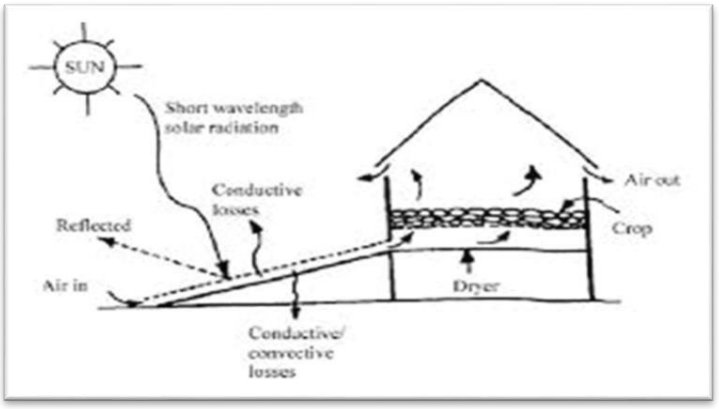

Fig. Methodology of project.

IV. WORKING

The dryer is a passive system in the sense that it has no moving parts. It is energized by the sun's rays entering through the collector glazing. The trapping of the rays is enhanced by the inside surfaces of the collector that were painted black and the trapped energy heats the air inside the collector. The greenhouse effect achieved within the collector drives the air current through the drying chamber. If the vents are open, the hot air rises and escapes through the upper vent in the drying chamber while cooler air at ambient temperature enters through the lower vent in the collector. Therefore, an air current is maintained, as cooler air at a temperature.

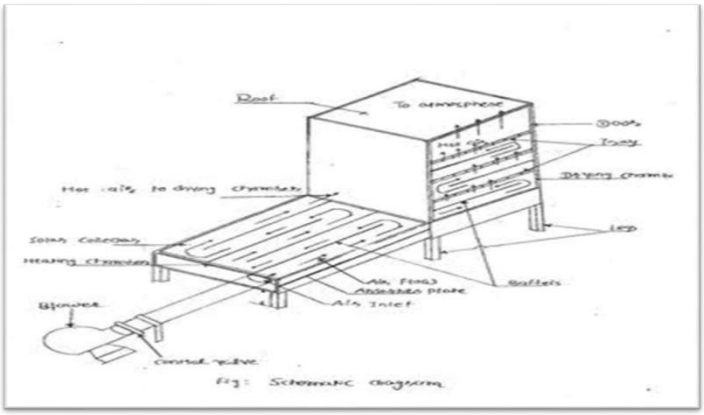

Fig. Construction diagram of project.

V. APPLICATION

1. Agricultural crop drying.
2.Food processing industries for dehydration of fruits and vegetables.
3. Fish and meat drying.
4.Dairy industries for production of milk powder.
5.Seasoning of wood and timber.
6.Textile industries for drying of textile materials.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

State Level Conference – AITCON 2K24

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 11, Special Issue 1, March 2024

VI. ADVANTAGES

1. To create a food drying solar dryer system.
2. To boost effectiveness.
3. To speed up a worker's or farmer's drying process.
4. To keep the stuff fresh for a long time.
5. Using solar power without cost.
6. Use the blynk app to work from anywhere in the world

VII. OBJECTIVE

The objectives of this project are:
1. To create 2D and 3D model of solar fruit dryer.
2. To design and construct a solar dryer.
3. To evaluate the solar dryer's performance
4.To protect the product against flies, pests, rain and dust.
5.It is labour saving. The product can be left in the dryer .
overnight or during rain.
6.To achieve better quality of product in terms of nutrients, hygiene
and colour.
7. To improve the bargaining position of farmers
8.To encourage people to establish their own gardens.

CONCLUSION

Using the concept of basic solar conduction dryer and implementing the automation and design enhancement, quality of agro products has been increased. By utilizing large amount of solar heat to maintain the quality of the food products is also achieved. From the experiment performed, the dryer accomplishes the temperature control at desired temperature. The overall reading observed that the maximum inside temperature was 52C. Corresponding average ambient temperature was 32.5C. It was also observed that the average solar radiation was 787.52 W/m2, average humidity was 20 % and average the air flow velocity was 0.89 m/s. The initial moisture content of Coriander was 88.43% which was reduced to 6.91% in one day.

REFERENCES

[1]. Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 4(11):8731-8740.
[2]. Dangi, N., 2017. Review on Monitoring environmental parameters: humidity and temperature using Arduino based micro controller and sensors.
[3]. Hedge, V. N., Horus, V. S., Rathod, S. K., Harsoor, P. A. And Badari, N., 2015. Review on Design, fabrication and performance evaluation of solar dryer for banana. Energy, Sustainability and Society Journal.
[4]. Louis, L. 2016. Review on Working principle of Arduino and using it as a tool for study and research, International Journal of Control, Automation, Communication and System (IJCACS), 1(2):21-29.
[5]. Moloney, C., 2016. India's major agricultural produce losses. [Online]. Available: https://www.firstpost.com/business/indias- majoragricultural-produce-losses-es timated-at- rs-92000-cr-2949002.html [Accessed on 30-July-2018]
[6]. Silva, A. S., Almeida, A. C., Lima E. E., Silva, F. L. H., Gomes, J. P., 2009. Drying Kinetics of Coriander Leaf and Stem, Cienciay Technologic Alimentaria 6(1); 13-19.
[7]. Singh, D., Meena, M. L., Chaudhary, M., Dayal, H. And Dudi, A., K., 2004. Review on Local Solar Tunnel Dryer for Small Scale, Entrepreneurship in Rural India, Central Arid, Zone Research Institute, Pali, Rajasthan, India. : 10-21.

© IARJSET This work is licensed under a Creative Commons Attribution 4.0 International License