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SMART DRYER

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Abstract The solar drying system uses solar energy to heat air and dry any food substance loaded, which is beneficial not only in that it reduces wastage of agricultural produce and aids in its preservation, but it also makes transportation of such dried produce simple and promotes people's health and welfare. The design and building of a residential passive solar food drier are presented in this work. The dryer is made up of a solar collector (air warmer) and a drying chamber with fruit and vegetable trays that are both connected. The air that enters via the air intake is heated in the solar collector and heaters before being used in the drying chamber (removing the moisture content from the food substance or agricultural produce loaded). The design was created using a hybrid method, which provides a more dependable approach for accurate design specifications. The container's iron body (painted), input and outlet fans (air ventilation system), mild steel metal sheet, and net trays for waste were all built with locally accessible materials.

Keywords: *Solar drying; Solar collector; Agriculture produce; Optimum temperature*

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I INTRODUCTION

One of the methods of food preservation is drying. The key to preventing rotting is to use a drying technique that removes enough moisture from the food. When it comes to food drying, the aim is to eliminate moisture as soon as possible at a temperature that does not adversely influence the food's flavour, texture, or colour. Traditional drying methods, such as sun drying and hot air convection drying, take longer to thoroughly dry the goods.

We created a drier for drying agricultural items quickly and efficiently in this project. For drying agricultural goods, we employ a lower pressure environment (vacuum), which allows the liquid to evaporate without raising the temperature. When used in conjunction with heat, vacuum drying may be a very effective way of drying. The smart drier dries the items without sacrificing their quality. The inexpensive cost of the smart dryer makes it suitable for both industrial and domestic use. When compared to traditional procedures, the drying time is shortened. A vacuum chamber, vacuum pump, heat source, temperature and humidity control system, and several auxiliary systems make up the device. In comparison to traditional methods, this gadget only requires a tiny space and may operate in a fully enclosed natural setting. It has a lot of practical utility as well as social and economic benefits.

Drying is the oldest method of preserving agricultural products, and it is a time-consuming and energy-intensive process. The use of alternative renewable energy resources has become more important as a result of rising fossil fuel prices and scarcity. Using renewable energy sources such as solar energy to dry agricultural goods is environmentally friendly and has a lower environmental effect. In underdeveloped nations, sun drying is a common and cost-effective method for drying food items. However, the process of drying is extremely slow and highly reliant on weather conditions. The poor quality of sun-dried items is mostly due to uneven drying, dust and dirt mixing, and insect and microbe contamination. In certain cases, bad weather causes the entire batch of goods to deteriorate. Solar drying is a possible alternative to sun drying for the drying of fruits and vegetables in impoverished nations. Due to significant investment and running expenses, mechanical drying, which is mostly employed in industrialised nations, is not suitable for small farms in developing nations.

II.AIM AND OBJECTIVE

1. The use of heat under regulated conditions to eliminate the water present in foods via evaporation to generate solid items is referred to as drying. Evaporation, on the other hand, produces concentrated liquid products.

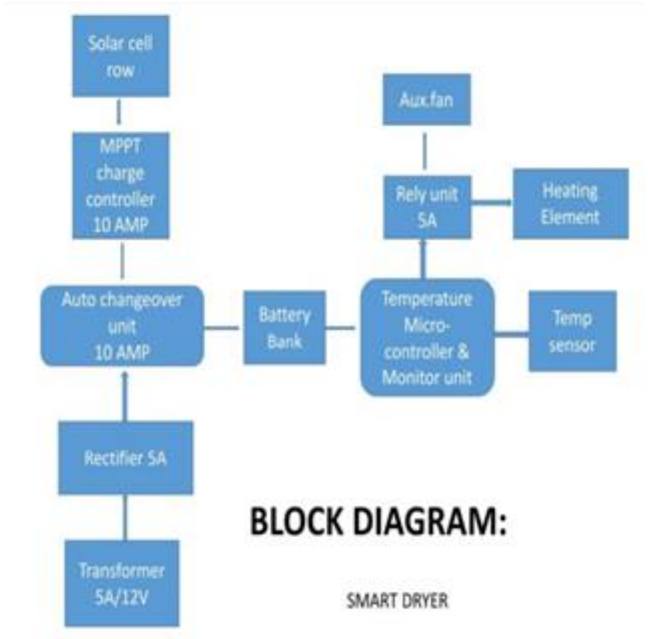
2. The primary goal of drying is to increase the shelf life of foods by lowering their in water activity.

3. In the absence of adequate water, microorganisms that cause food deterioration and decay, as well as numerous enzymes that promote undesirable changes in the chemical makeup of food, are unable to grow, proliferate, or operate.

III. DESIGN OF GFRG BUILDING

The use of heat under regulated conditions to eliminate the water present in foods via evaporation to generate solid items is referred to as drying. Evaporation, on the other hand, produces concentrated liquid products. The primary goal of drying is to increase the shelf life of foods by lowering their in-water activity. In the absence of adequate water, microorganisms that cause food deterioration and decay, as well as numerous enzymes that induce undesirable changes in the chemical makeup of food, are unable to grow, proliferate, or operate

IV.BLOCK DIAGRAM

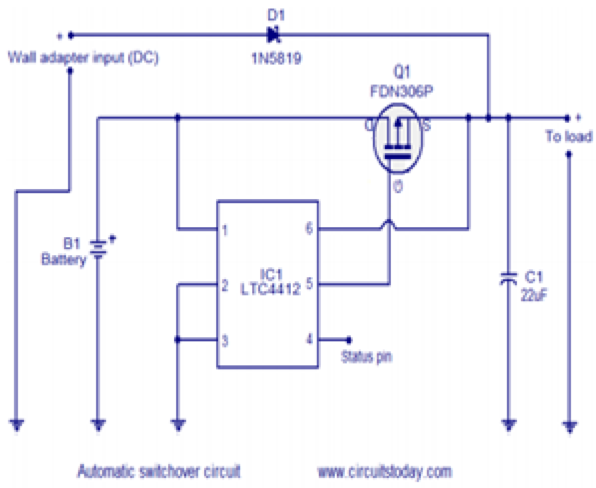


V.EXPLANATION

There is a rising realisation in many areas of the world that renewable energy may help farmers in underdeveloped nations enhance their output by extending technology to them. Solar thermal technology is fast gaining favour as a cost-effective energy-saving technique in agriculture. Because it is plentiful, limitless, and nonpolluting, it is favoured above other alternative energy sources such as wind and shale. Solar air heaters are simple devices that use solar energy to heat air. They are used in a variety of applications that need a low to moderate temperature below 80 degrees Celsius, such as crop drying and room heating. The preservation of agricultural goods relies heavily on drying techniques.

They are characterised as a moisture removal technique including both heat and mass transport. Food items include two forms of water: chemically bonded water and physically held water, according to experts. Only the physically retained water is eliminated while drying. The appeal of dried products is mostly due to their extended shelf life, product diversity, and significant volume reduction. With advances in product quality and process applicability, this might be pushed much further. The use of dryers in poor nations can help to minimise post-harvest losses and increase the availability of food in these areas. The losses are usually estimated to be on the order of 40%, but they might be as high as 80% in extreme circumstances. Proper and/or timely drying of commodities such as cereal grains, legumes, tubers, meat, fish, and so on accounts for a major portion of these losses.

VI.CIRCUIT DIAGRAM



NAME OF COMPONENTS	QUANITY	RATING
RESIRTORS	4	1kohm, 40ohm
CAPACITORS	4	10Mf, 50V
TRANSISTORS	2	1.0 A
LED BULB	1	--

VII.CONSTRUNCTION

The construction of a bridge rectifier is depicted below. This circuit may be built with four diodes, D1, D2, D3, and D4, as well as a load resistor (RL). To efficiently convert AC (alternating current) to DC (direct current), these diodes can be connected in a closed-loop arrangement. The lack of a unique center-tapped transformer is the key advantage of this design. As a result, both the size and the cost will be lowered. The o/p DC signal may be obtained across the RL after the input signal is applied across the two terminals A & B. A load resistor is linked between two terminals, C and D, in this case. Two diodes can be arranged in such a way that the electricity is transmitted by two diodes during every half cycle. During the positive half cycle, pairs of diodes such as D1 and D3 will conduct electric current. D2 and D4 diodes, on the other hand, will carry electric current throughout a negative half cycle.

VIII.DESIGN IMPLEMENTATION

With the assistance of a digital sensor, the ambient temperature was measured during the trials. The design, construction, and performance of a mixed-mode solar dryer for food preservation are presented in this project. The dryer demonstrated adequate ability to dry food products to an acceptable moisture level in a reasonable amount of time while also ensuring exceptional quality of the dried product.

IX.CONCLUSION

The performance of the dryer is heavily influenced by the operating parameters of the automated temperature control system. The temperature of the dryer system controls the quality of the product in terms of moisture fluctuation; nevertheless, high temperatures can harm the product, lowering its quality. Controlling humidity in the dryer boosted its efficiency as much as the venting system required within the dryer. When the novel hybrid model is used to simulate the drying system, it results in reduced energy usage, good product quality, and cheap process costs.

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