

# Review of Temperature Conditioning for Solar Dryer

Ms. Shikhare.T.M<sup>1</sup>, Ms. Bhangе.Y.N<sup>2</sup>, Dr.Vibhute.A.S<sup>3</sup>

<sup>1</sup>Dept. of ENTC Engineering, SVERI'S COE Pandharpur

<sup>2</sup>Dept. of ENTC Engineering, SVERI'S COE Pandharpur

<sup>3</sup> Professor, Dept. of ENTC Engineering, SVERI'S COE pandharpur

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**Abstract** - Presently solar dryer energy is widely preferred to generate heat and produce electricity. Different types of solar dryers are available in the market like Direct, Indirect, folded and tunnel, etc... In that the indirect type of solar dryer has some disadvantages to overcome this we have implemented the object or the advanced system. Solar heating systems to dry foods and increase the quality of the product, while reducing the wastage produces. This paper represents the detail information about the temperature conditioning for solar dryer and performance of it.

**Key Words:** IC89c51, LCD display, keypad, DHT22 temperature and humidity sensor, solar dryer, Exhaust fan etc..

## 1. INTRODUCTION

This project is all about the different types of fruits are dried at the different temperature automatically. Solar dryer is the renewable energy resource which is widely used in the different application like to dry the fruits, vegetable, fish, meat, seeds and it is also used in the agriculture purpose.

The principle of the solar drying technique is to collect the solar energy by heating-up the air volume in solar collectors. In this we have made the object at a time it displays the temperature and humidity of the product on the LCD display. Solar dryer is more economical compared to dryers that run on the conventional fuel/electricity.

Drying is the most conventional methods used for prevention and storage, which works on the basis of reduction in the water content in the product. The reduction in the water content brings the physical as well as the chemical stability in the product. Also, it reduces the weight and the volume of the product and hence the transportation cost also reduces.

Drying improves the quality of the product and reduces product loss due to moisture content. For this process of drying and dehydration of any product sever techniques have been employed which solar drying, hot air, freeze drying, osmotic dehydration, etc.

## 2. METHODOLOGY

The design used for fruits drying chamber needs the temperature to be maintained constant throughout the chamber also removal moisture content in the fruits. This

automation process completed is informed to the former. Solar energy is utilized for dehydrating the fruits.

The system indicates the temperature from the IC89c51 and it will display on the Liquid Crystal Display. The temperature is compared with the setting value.

Generally the solar dryer is classified into two major groups namely:-

### 2.1 Active solar dryer system

Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy.

### 2.2 Passive solar dryer system

Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air. There are many types of passive solar dryer is used in old drying techniques.

There are two main types of solar dryers-

#### 2.2.1 Direct solar dryer

Direct solar dryers expose the substance to dehydrate to direct sunlight. It is the one of the type of solar dryer which consist of black absorbing surface which collect the light and convert it into the heat.

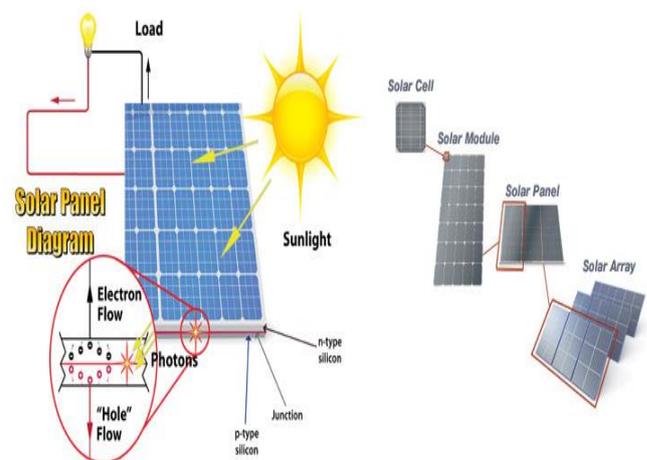


Fig1. Direct Solar Dryer

### 2.2.2 Indirect solar dryer

In this the solar radiation is absorbed and converted into heat by another surface; it is called as a collector. The heat is generated from the solar energy it is used to dry the food items in the dryer. The main advantage of the dryer is the temperatures can be controlled.

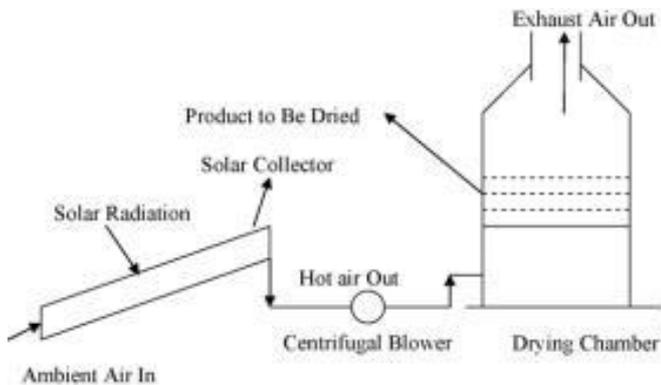


Fig2. Indirect solar dryer

### 3. BLOCK DIGRAM

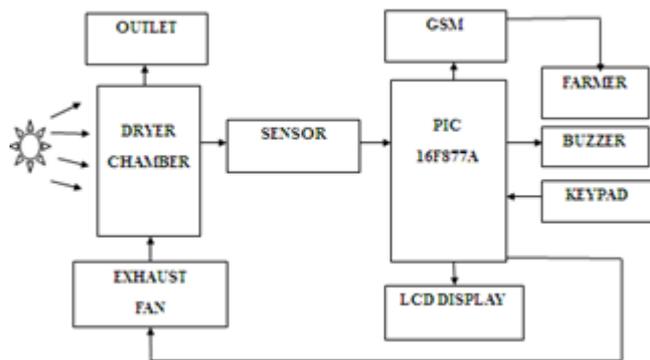


Fig3. Block Diagram of Solar Dryer

#### Microcontroller 89C51:

ATMEL 89c51 HAS 4kb of flash programmable and erasable read only memory. It has 128 bytes of RAM. 8 bit Microcontroller means it can read, write and process 8 bit data. Basically 8 bit specifies the size of the data bus. 8 bit Microcontroller means 8 bit data can travel on the data bus.

#### Sensor

DHT 22 is the basic, low cost digital temperature and humidity sensor. Compare to DHT11 it is more accurate and work in a bigger range of temperature and humidity. The only real downside of this sensor is you can only get new data from it once in every two seconds. In this project we have used the DHT22 sensor because it measures the higher ranges of the temperature and humidity of different product which can dry in the solar dryer. For measuring humidity they use the humidity sensing component has two electrodes

with moisture holding substrate between them. So humidity changes with a conductivity of substrate changes of resistance between these electroads are changing.

| DHT22 pins |      |
|------------|------|
| 1          | VCC  |
| 2          | DATA |
| 3          | NC   |
| 4          | GND  |

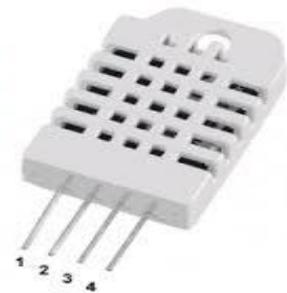


Fig 4. DHT22

#### Technical details

1. Low cost.
2. 3 to 5V power supply.
3. Maximum current is 2.5 MA.
4. Good for 0-100% humidity readings.
5. Good for -40 to 125 degree temperature readings.
6. No more than 0.5HZ sampling rates.
7. 4 pins 0.1 spacing

#### Keypad

Basic 12 A button keypad is used for user input. The buttons are set up in a matrix format. This allows a microcontroller to scan the 7 output pins to see which of the 12 buttons is being pressed. Keypads allow users to input data while a program is running. A keypad is often needed to provide input to a system. A 12 button keypad consists of 3 columns and 4 rows.

Here we use the keypad for giving the input temperature ranges to the Microcontroller means keypad is used as an input device to the controller. In this project we have used the 4x3 keypad means four rows and three columns.

#### LCD displays

It is used as an output device to the microcontroller which displays the temperature and humidity ranges of the fruits and vegetables. Here we use the 8 bit display and it has 8 data lines and 3 special purpose pins that are R/W, EN, RS. When the temperature is displayed on the LCD according to that temperature we can turn on and turn off the fan to maintain the temperature of fruits.

#### Buzzer

The buzzer is also as an output device and used for indication purpose when fruits are dried completely. It has also given the indication of the drying is completed and is ready to use.

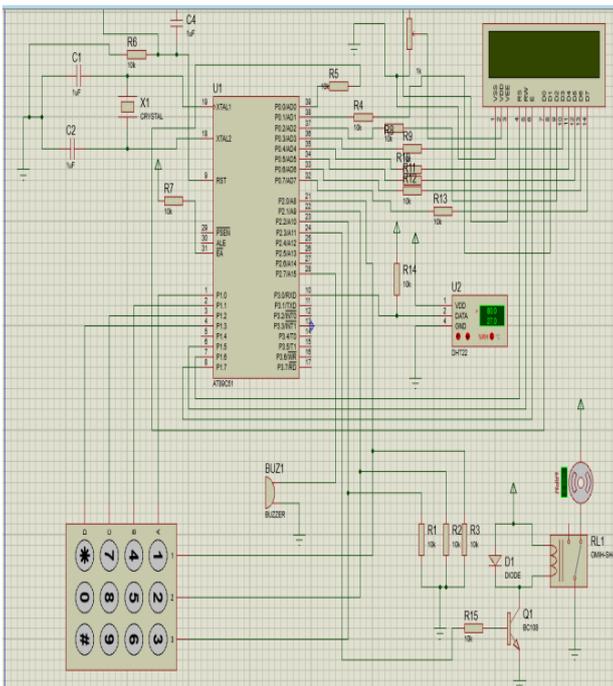
**Exhaust fan**

In this system fan is used to control the temperature inside the solar dryer according to the set point temperature. When the temperature goes higher than the set point then fan automatically turns on otherwise it is in off condition.

**Relay**

Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.

**3.1 Software Result**



**Fig 5.** Software Simulation

**3.2 Algorithm:**

1. Start
2. Solar radiation from the sun given to the drying Chamber.
3. Set two temperatures set points UTP and LTP and timer.
4. Read temperature in the drying chamber.
5. Compare to the drying temperature with set point temperature.
6. Display temperature on LCD display.
7. If the temperature is greater than UTP then turn on the fan.
8. If the temperature is less than UTP, wait for some time.
9. If drying is completed ,then turn on the buzzer.
10. If buzzer, turn on send the message to user through the GSM.

**4. CONCLUSION**

In conclusion, the process in developing this innovative circuit done successfully. The hardware implementation and its operation are functioning accordingly and smoothly following the procedure. The circuit has fulfilled the main objective, which control the speed of the fan using temperature controlled with 89c51.it has special safety features it alters signal temperature overheat. This circuit is really practical to be applied, especially today's hot condition.

**5. REFERENCE**

- [1]. Yergin, Daniel (1991). The Prize: The Epic Quest for Oil, Money, and Power. Simon & Schuster.p. 885. ISBN 0-671-79932-0.
- [2]. Okechuk , O. V., & Norton, B., Review of solar-energy drying systems: an overview of solar drying technology, Energy Conversion Manage; Vol.40 (6), pp.615–655, 1999.
- [3]. Cortés-Olmos, C.; Leiva-Brondo, M.; Roselló, J.; Raigón, M.D.; Cebolla-Cornejo, J. The role of traditional varieties of tomato as sources of functional compounds .J. Sci. Food Agric. 2014. [Google Scholar] [CrossRef] [PubMed]
- [4]. Automatic temperature conditioning, International Journal of Research Available at <https://edupediapublications.org/journalsp-ISSN: 2348-6848 e-ISSN: 2348-795X Volume 03 Issue 08 April 2016>.
- [5]. Automatic Solar Dryer, International Journal of Modern Trends in Engineering and Research [www.ijmter.com](http://www.ijmter.com)-ISSN No.:2349-9745, Date: 2-4 July, 2015.
- [6]. Sachin V. Jangam, Chung Lim Law and Arun S. Mujumdar,Drying of Foods, Vegetables and Fruits, 2010.
- [7].R.J. Fuller, Solar Energy Conversion and Photoenergy Systems, (1994).
- [8]. DrBindu, Rekha, Viji ChandranIOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676, p-ISSN: 2320-3331, Volume 11, Issue 5 Ver. IV (Sep - Oct 2016).
- [9].RaviHosamani, Dr.Satish.R.Desai, Solar Based Temperature Controlled FruitDrying System,International Journal of Research in Instrumentation Engineering (IJRAIE) Vol. 1, Issue. 2, Sep. 2013.
- [10]. Mr. Patil Kiran, Ms. Swami Sonam, Ms. Thorat Ashwini, Ms. Mane Pratidnya,Solar Powered Automatic Fruit Drying System, International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 5, Issue 3, March 2016.
- [11].Y. Baradey, M. N. A. Hawlader, A. F. Ismail, M. Hrairi, M. I. Rapi, Solar Drying of Fruits and Vegetables, International Journal of Recent Development of Engineering and Technology Website: [www.ijrdet.com](http://www.ijrdet.com) (ISSN 2347-6435(Online) Volume 5, Issue 1, January 2016).