INTEGRATED SOLAR DRYING SYSTEM

G. Neelavathi[1], Gangabathina Dhanush Kumar[2], Akumalli Ameer[3], Mucchala Jagadeesh[4]

[1&2]Assistant Professor, Department of ECE, Mahendra Engineering College

[3&4] UG Students, Department of ECE, Mahendra Engineering College

Abstract

This project presents the design and development of an automatic solar powered grain dryer used to remove the moisture content from grains, post harvesting. The drying is achieved by allowing the heat from heat chamber to flow on to the conveyor path with the help of exhaust fans present in the heat chamber. The grains are layered evenly on the conveyer path upon which the heated air is passed to extract the moisture from the grains. Arduino Uno along with the DHT11 sensor is used to monitor and control the moisture content, speed of the motor and temperature of the heating chamber. Based on the moisture content present in the grains, the sensor sends the control signal to the controller. Thus, the speed of the conveyer location is adjusted accordingly to maintain required moisture content in the grains, which is ideally required for storage. The prototype of the system is developed and powered using solar photovoltaic energy generated from 5V solar panel.

Keywords: Solar Energy, Temperature Detection, LCD, Arduino.

I. INTRODUCTION

The dependence on non-renewable energy sources for the development of different systems has many inverse effects on humankind. As they are one way of pollution and it may charge the cost. In this context, the search for renewable energy sources and their maximum application have much more importance. Solar energy is one that can be easily harvested and stored in other applications. It is very easy to convert solar energy to electrical energy using solar cells. They have a wide field of applications. Major drying process both in the domestic and industrial sector are using solar energy. It has many advantages over other systems.

II. EXISTING SYSTEM

In the existing method they are connecting the sensors to the microcontroller (8051) and controlling the things also doing by using microcontroller.

Drawbacks:

- Cost effective.

III. PROPOSED SYSTEM

In this project the voltage coming from solar panel is taken to Battery and is fed to power supply board which supplies DC Voltage to all the modules in the project.

Based on the DHT11 Values the fan will rotate in order to dry the grains in storage system. LCD will display the temperature and humidity in that room.

Block Diagram:

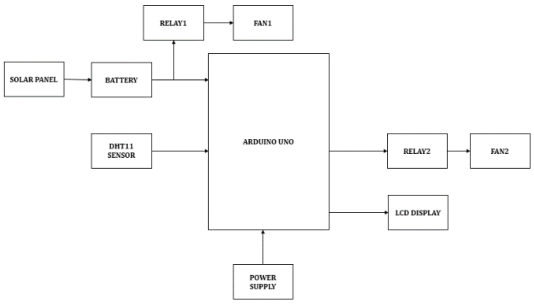

Fig1: Block Diagram

IV. HARDWARE REQUIREMENTS

Arduino:

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

Fig2: Arduino

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

DHT11 Sensor:

The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).

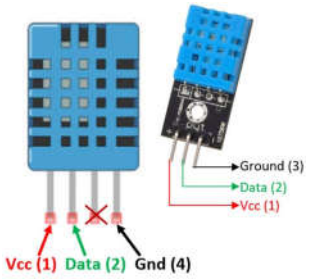

Fig3: DHT11 Sensor

LCD:

16×2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. But the most used one is the 16*2 LCD; hence we are using it here.

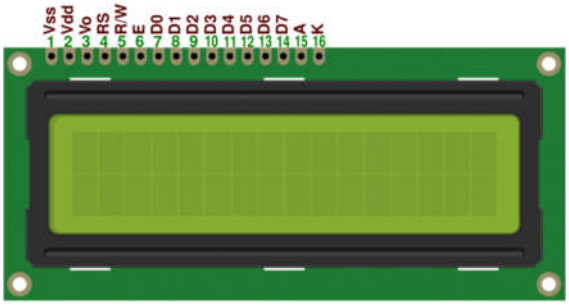

Fig4: LCD

Solar Panel:

Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat. Description: A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect.

Fig5: Solar Panel

12V Battery:

A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts. A battery cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between.

Fig6: 12V Battery

V. SOFTWARE REQUIREMENTS

Arduino IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

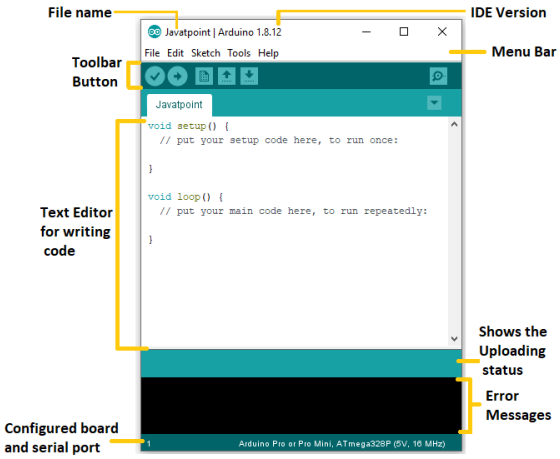

Fig7: Arduino IDE Window

VI. ADVANTAGES

- Drying is faster because inside the dryer it is warmer than outside.
- The product is protected against flies, pests, rain and dust.
- Productivity increase in terms of labour, energy cost saving
- Less spoilage or less wastage of dried products
- Higher durability and transparency over time (important for green-house effect)
- UV protection of Solar Dryers maintains colors and nutrients of fruits and vegetables

VII. APPLICATIONS

- They can be utilized in industries such as fruit and food processing, paper, pharmaceutical, and agro-industries

VIII. RESULTS

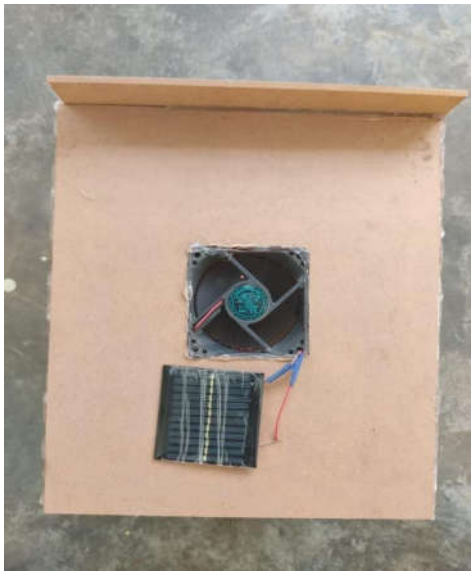

Fig8: Solar Panel Attached for Energy

Fig9: Hardware Setup of the Project

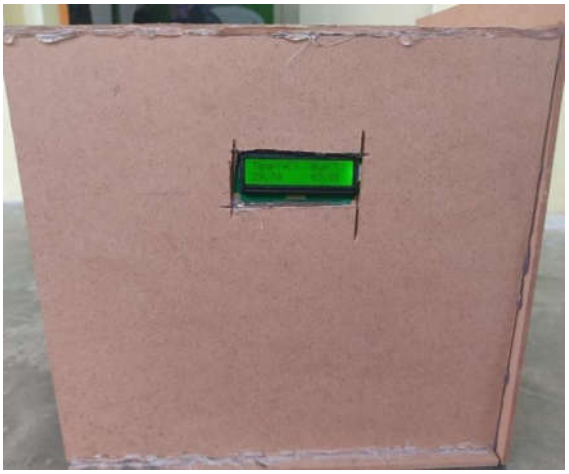

Fig10: Values of the Sensors

CONCLUSION

The drying of materials can be done under the sun with this design, as we considered the benefits of drying using solar energy. The use of the sensors (both temperature and rain) can reduce the human attention which is the main drawback of the conventional method of drying under the sun. The maximum solar energy can be utilized by using the system designed as it reduces the electricity consumption in modern techniques of automatic drying system. It is highly sustainable one and eco-friendly method. Using this simple technique and low-cost components, we can make it available for every person and it has more useful in the domestic purposes of drying.

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