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Production of Betel Powder for Human Increasing Immunity from Portable Solar Drier for Nourishment

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ABSTRACT

Bioelectricity generation from organic wastes through the metabolic activities of microbes using MFCs is a promising Green Technology transforming Waste to Energy. Organic wastes from agriculture waste or are generated daily in large quantities in Port Harcourt metropolis from markets and homes. Baseline survey revealed huge quantities of these Betel Leaves Along With Nuts wastes. If these wastes are not collected regularly and disposed of properly, their accumulation may lead to serious health problems as they decay with time. Heaps of Betel Leaves Along With Nuts wastes are found in the market refuse dump, which is our sample collection site. It had close proximity to other places of business and residence. This study was therefore carried out using some Betel Leaves Along With Nuts wastes from Betel Leaves Along With Nuts. These are agriculture waste that are consumed daily by the people. Various weights of 4kg, 6kg, 8kg, 10kg and 12kg of each type of these agriculture waste were used. Results showed that the 12kg substrate produced the highest voltage. The pH, DO and BOD of the substrate solution decreased at the end of Day 7 for each weight. The electricity generated was capable of powering small portable devices such as cell phones, rechargeable torch, and electrical bulb of 2V.

I. INTRODUCTION

1.1 General

From the ancient days, the drying process of the edible materials is more common to preserve it. But it was a direct exposure to sunlight without any shielding and there is no control in the atmospheric temperature. The temperature changes accordingly with the change in atmospheric pressure and humidity. This method is convenient only at the hot weather conditions. Hence there may have the break in the drying process if the weather is changed into cloudy or rainy. That's why the concept of solar dryers with shielding is introduced.

The main objective of the solar dryer is to maintain the temperature as warmer (55°C - 75°C). The temperature should be maintained irrespective with the atmospheric temperature conditions. The solar dryers may be used with the source of sunlight alone or it may be used with the additional source of the external heating element (IR Lamps). Later is has

been developed for the commercial uses and entire heat is given by the ovens to dry the edibles.

After knowing the advantages of renewable energy resources and considering the parameter of energy efficiency the solar dryers using the solar radiations alone are come to use. This is made possible by providing the dryer with the quality material Polycarbonate sheet. It has the capability of holding the heat within the closed surface over a long time, even up to 1-2 days without any intrusion of humid air, loss of heat or change in pressure. But the main risk factor is the cost of the material used.

As the high cost and high quality polycarbonate sheet is used in most of the areas for its efficiency, the usage of solar dryer is minimized. The capital cost of the solar dryer is usually high due to main reason the material used and its installation.

1.2 PROJECT STATEMENT

To design and develop a solar dryer which dries betel leaf with application of only a small amount of effort and use of solar energy.

II. LITERATURE REVIEW

In many parts of the world there is a growing awareness that renewable energy has an important role to play in extending technology to the farmer in developing countries to increase their productivity (Waewsak,et al., 2006). Solar thermal technology is a technology that is rapidly gaining acceptance as an energy saving measure in agriculture application. It is preferred to other alternative sources of energy such as wind and shale, because it is abundant, inexhaustible, and non-polluting(Akinola 1999; Akinola and Fapetu 2006; Akinola et al., 2006).

The application of dryers in developing countries can reduce post-harvest losses and significantly contribute to the availability of fruit in these countries. Estimations of these losses are generally cited to be of the order of 40% but they can, under very adverse conditions, be nearly as high as 80%. A significant percentage of these losses are related to improper and/or untimely drying of fruit chips such as banana, mango, apple, chickoo etc. (Bassey, 1989; Togrul and Pehlivan, 2004).

The simplest design for a solar dryer was developed by the Brace Research Institute, Canada, (1975). It is essentially a hot box where fruits, vegetables or other materials can be dehydrated on a small scale.

The dryer with heat storage material enables to maintain consistent air temperature inside the dryer. The inclusion of heat storage material also increases the drying-time by about 4 hours per day. The chilli was dried from initial moisture content 72.8% to the final moisture content about 9.2% and 9.7% in the bottom and top trays respectively. They concluded that, forced convection solar dryer is more suitable for producing high quality dried chilli.

III. CHAPTER 3 EXPERIMENTAL SETUP

A thermal–chemical equilibrium model was developed to predict the syngas composition and its heating value. This model and the associated assumptions were developed specifically for the downdraft gasifier selected for our trailer system. The detailed description of the model and the assumptions are provided in. The main chemical reaction is the global equation of the gasification process with partial combustion for heat supply and is given below,

The value for X and Y were determined from the ultimate analysis of biomass feedstock and the w was set from the feedstock moisture content. The equilibrium calculations were carried out with H2, CO, CO2, H2O and CH4 as the exit syngas components together with N2. It is assumed that

there is no soot formation and all biomass is converted to the exit gas composition under a high temperature with no tar. To solve Equation A-1, there are six unknowns in the equation from a1…a6 to m, and therefore, six equations should be developed. These six equations are formulated from the C, H, O balance equations using Equation A-1, the equilibrium constants for the methane reforming reaction (Equation A-2), the water gas shift reaction (Equation A-3), and the enthalpy balance equation for Equation A-1.

The details on the solution procedure that include the rate constant calculations and the development of the set of coefficients used for calculating the different enthalpies of the gas species at the equilibrium temperature are explained in. The results on the syngas compositions and associated heating values for the four different feedstock based on the equilibrium model analysis are given in Table A-4. The syngas compositions predicted by the equilibrium model were partially verified by the experimental data as shown in Table A-5 as the CO content was not able to be measured due to equipment limitation. The thermodynamic efficiency of the gasifier is calculated using the ratio of the calorific value of the syngas to that of the respective biomass feedstock as shown below.

The calorific value of the feedstock was selected for each feedstock from Table A-2 and the calorific value of syngas was obtained from the LHV of the syngas that is listed in Table A-4 and Table A-5. The heating value of syngas could not be determined experimentally since the GC used was not able to employ argon as the carrier gas but only nitrogen. Since the molecular weight of nitrogen and carbon monoxide are same it was not possible to determine the peaks and hence the concentration of it in the syngas. Hydrogen and methane were detected since they have a different molecular weight than 28. Hence, theoretical model was used to calculate the heating value of the syngas. The model considers no tar formation, as a result the hydrogen composition estimated by the model is higher and methane is lower than the experimental results which can be seen by comparing the GC results. The syngas composition for hydrogen and methane was compared to validate the model.

IV. WORKING PRINCIPLE

Step one Betel leaf was mixed will and leaf is fined crushed then it can be dry with help of solar dryer and mixing some aromatic flavour's (clove cardoman etc…). Then belong the process need to extraction.
The waste agriculture waste were collected from the Betel Leaves Along With Nuts waste heap at the market dump site and kept in the laboratory for 3 days to decompose naturally. The 4kg Betel Leaves Along With Nuts waste were each loaded into plastic containers (the MFCs) and filled to brim with water and the terminal connected to a digital multimeter. Initial readings were taken for voltage, pH, DO and BOD. At the end of 7 days, the color change was noted before discarding the substrate solution. This process was carried out in the department of Science Laboratory Technology, Ken Saro Wiwa Polytechnic at room temperatures of 25 ± 2C for a period of 40 days with a day interval between each batch to enable us wash and prepare the cell for the next batch (weight) of Betel Leaves Along With Nuts wastes.

V. CONSIDERATIONS OF EXISTING SYSTEM

5.1 NEED FOR DRYING

There are various needs for drying, in which they are following,

- The main purpose of drying the food materials is to preserve it for longer periods.
- It may help in emergency situations such as, at the time of natural disasters, wars etc.,
- The food materials can be easily transported to long distances

- The storage of bulk amount of food materials at the particular place is possible
- The quality of the food products may be increased
- The food materials can be converted into the food products
- It increases the market price of the particular food material

5.2 OBJECTIVE OF SOLAR DRYER

The objectives of this project are:

- To create 2D and 3D model of solar dryer.
- To design and construct a solar dryer.
- To evaluate the solar dryer's performance
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- To evaluate the solar dryer's performance.
- To product against flies, pests, rain and dust.
- It is labour saving, the product can be left in the dryer overnight or during rain.
- To achieve better quality of product in terms of nutrients, hygiene and colour.
- To improve family nutrition because fruit and vegetables contain high quantities of vitamins, minerals and fibre

5.3 TEMPERATURE CONDITIONS

The temperature conditions of the atmosphere plays a major role in time duration of the drying process. The temperature range of the different regions around the world is given below.

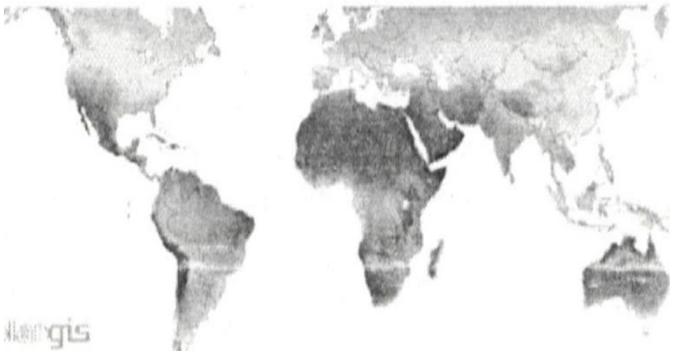

Figure 5.1: Temperature regions around the world

Table 5.1: Average temperature around Trichy region

Temperature				Precipitation
Months	Normal	warmest	Coldest	Normal
January	26.3°C	28.6°C	23.9°C	3
February	27.0°C	30.3°C	23.8°C	1
March	28.5°C	31.8°C	24.8°C	2
April	30.5°C	33.8°C	27.1°C	3
May	30.9°C	34.0°C	27.8°C	2
June	30.2°C	33.0°C	27.3°C	0
July	29.9°C	33.0°C	26.7°C	1
August	29.5°C	32.6°C	26.3°C	1
September	29.3°C	32.5°C	26.0°C	2
October	28.6°C	31.7°C	25.5°C	9
November	27.4°C	30.0°C	24.7°C	12
December	26.3°C	28.5°C	24.1°C	10

The atmospheric temperature change is inversely proportional to the atmospheric pressure in which the increase in pressure reduces the temperature.

$$\text{ATMOSPHERIC PRESSURE CHANGE} \propto 1/TEMPERATURECHANGE$$

5.4 SOLAR ENERGY AND GLOBAL RADIATION

5.4.1 Solar Energy

The sun is the primal energy producer of our solar system. Because of continuous nuclear fusion taking place in its core, a tremendous amount of energy is generated. A small fraction of the energy produced in the sun hits the earth and makes life possible on our planet. Solar radiation causes all natural cycles and activities such as rain, wind, ocean currents, photosynthesis and several other phenomena which are crucial for life. The entire world energy need has been based from the very beginning on solar energy. All fossil fuels (coal, gas, oil) are converted form of solar energy. The solar surface temperature of the sun is 6000°C which corresponds to 70,000 to 80,000

kW/m2 radiation intensity. Earth receives only a very small portion of this energy. In spite of this, the incoming solar radiation energy in a year is some 2.1017 kWh; this is more than 10,000 times the yearly energy demand of the whole world.

The solar radiation intensity outside the atmosphere is nearly 1,360 W/m2(solar constant). When the solar radiation penetrates through the atmosphere some of the radiation is lost so that on a clear sky sunny day in summer, 800 to 1000 W/m2 (global radiation) can be obtained on the ground.

5.4.2 Global Radiation

The duration of the sunshine as well as its intensity dependents on the time of the year, weather conditions and naturally also on the geographical position. The amount of annual global radiation on a horizontal surface may thus reach in the Sun Belt regions over 2,200 kWh/m2. The global radiation composes of direct and diffuse radiation.

The direct solar radiation is component which falls from the direction of the sun. The diffuse radiation component is created when the direct solar rays are scattered from the different molecules and particles in the atmosphere into all directions, i.e. the radiation becomes dispersed. The amount of diffuse radiation is dependent on the climatic and geographic conditions. The global radiation and the proportion of diffuse radiation are greatly affected by clouds, the condition of the atmosphere (e.g.. haze and dust layers) and the path length of the beams through the atmosphere.

5.5 Drying And Storing

5.5.1 Drying Of Betel Leaf

Fruits are washed and dried initially. This is caused by oxidation which can damage flavour and vitamin content. To prevent oxidation you can dip the betel leaf slices in a preserving solution.

One solution is a salt water dip which is made by adding six tablespoons of pickling salt to one gallon of water. Soak for two to three minutes, then drain. Another solution is two tablespoons of ascorbic acid powder to one quart of lukewarm water. Soak, drain, and dry as above. Betel leaves are dry when somewhere between leathery and brittle. Drying times are affected by a number of factors, so experience and common sense are the best guides. After sun drying betal leaf it needs to be "equalized." Remove from trays and place in a bowl inside the house. Several times per day, for one week, stir the leaves pieces. This will allow any moisture from pieces that are not totally dry to be transferred to those which are totally dry. Another way to equalize dried leaves t is to place it in a paper bag after removing from drying trays. Fold over the top of the bag and hang from the clothes lines. Shake gently several times a day for two days.

5.5.2 Storing Dried Leaf

Often betel leaves, even when dry, will stick together when stored. A tasty way to help prevent this is by "dusting" before storing. Powdered sugar, spices, or powdered oats can be used as "dust." Place it in a bag then add leaves and shake to coat the pieces. Dusting leaves leather or placing pieces of paper between the rolls will prevent them from sticking. Almost anything can be used as a storage container, as long as it has a tight fitting lid. Recycled jars or other containers work well, as well as storage bags or canning jars. If using a metal lid, place a piece of paper between the food and lid. Light causes oxidation, so store the dried food in a dark place or put the containers inside paper bags or a cardboard box to block light. Keep in a cool place. Storing in small batches is wise. In the event one piece is not dry, it will not ruin the entire batch. Check weekly for signs of meld for the first several weeks. Label the food before storing.

5.6 WATER CONTENT OF THE EDIBLES

All the living beings are composed of water content from unicellular level to the Multi-cellular level. The

Betel leaf have different proportions of the water content in its body.

VI. OVERVIEW OF SOLAR DRYING

6.1 CONSTRUCTION OF SOLAR DRYER

The materials used for the construction of the mixed-mode solar dryer are cheap and easily obtainable in the local market. The solar dryer consist of the solar collector (air heater), the drying cabinet and drying trays.

6.2 SOLAR DRYER COMPONENTS

6.2.1 Drying Chamber:

The drying chamber was made up highly polished wood wish consist of three drying trays also made of wood, the material has been chosen since wood is a poor conductor of heat and its smooth surface finish and also heat loss by radiation is minimized.

6.2.2 Heating Chamber:

It consists of following components:
Cover plate, absorber plate, insulation.

6.2.3 Cover Plate:

This is a transparent sheet used to cover the absorber, thereby preventing dust and rain from coming in contact with the absorber, it also retard the heat from escaping, common Materials used for cover plates are glass, fibre glass, flexi glass, but the material used for this Project is glass.

6.2.4 Absorber Plate:

This is a metal painted black and placed below the cover to absorb, the incident solar radiation transmitted by cover thereby heating the air between it and the cover, here aluminium is chosen because its quick response in absorption of solar radiation and also copper because of its good ability to keep the absorbed solar radiation.

6.2.5 Insulation:

This is used to minimize heat loss from the system, it is under the absorber plate, the insulator can withstand stagnation temperature, it is fire resistant and not subject to out-going gassing and it is damageable by moisture or insect, insulating materials are usually fibre glass, mineral wool, Styrofoam and urethanes, but here Styrofoam was chosen.

6.2.6 The Orientation Of The Solar Collector

The flat-plate solar collector was always tilted and oriented in such a way that it receives maximum solar radiation during the desired season of used. The best stationary orientation is due south in the northern hemisphere and due north in southern hemisphere. Therefore, solar collector in this work is oriented facing south and tilted at 17.11º to the horizontal. This is approximately 10 º more than the local geographical latitude (Abeokuta a location in Nigeria, 7.11ºN), which according to (Adegoke and Bolaji 2000), is the best recommended orientation for stationary absorber. This inclination is also to allow easy run off of water and enhance air circulation.

VII. MODELS CONSIDERED

7.1 Tested Material

The model has tested for the material to be used to have the advantage of low cost, high heat holding capacity and an appropriate replacement for the Polycarbonate.

7.1.1 Spiral Sheet Testing

It is a normal plastic sheet and it is tested for heat holding. But the heat is escaped from the closed surface at a rate of 2°C/min and the heat goes up to 38°C. Hence the spiral sheet is not suitable for the project and it has excluded

7.1.2 X-Ray Sheet Testing

The X-Ray sheet has selected for the capability of high heat withstanding property. It is made up of

emulsion-gelatine containing radiation sensitive Silver halides such as Silver bromide, Silver Iodide etc.,

The reason for the heat withstanding of this sheet is due to the properties of gelatine and the silver halides as present in the photographic films.

The properties of gelatine are,

- High viscosity
- High heat withstanding
- Easily soluble and can be used as emulsion
- High melting point such as above 212°F
- High mechanical strength

The properties of Silver-halides are,

- Highly photosensitive
- It easily forms redo reaction at the exposure of light
- The allowance of photons is also very easy

The X-Ray sheet has the high allowance of solar light but there is a limitation in which the heat loss is occurring at a common rate as 1°C/min

7.1.3 PVC Sheet Testing

The PVC sheet has been selected because of the combination of various compounds which may have specific thermal and optical properties. The properties of the polyethylene sheet are as following,

- Low cost
- Flexible
- Melting point is 115°C
- Good transparency
- Lower density and less weight
- Chemically inert

Figure 7.1: PVC sheet model

We have tested with the polyethylene sheets to cover around the PVC [Poly Vinyl Chloride] pipe for the simple apparatus and for the low weight and cost. The testing process results in a positive sign and the temperature goes beyond 55°C and the heat loss from the apparatus is at a rate of less than 1°C for 4mins.

7.1.4 Comparison of Testing:

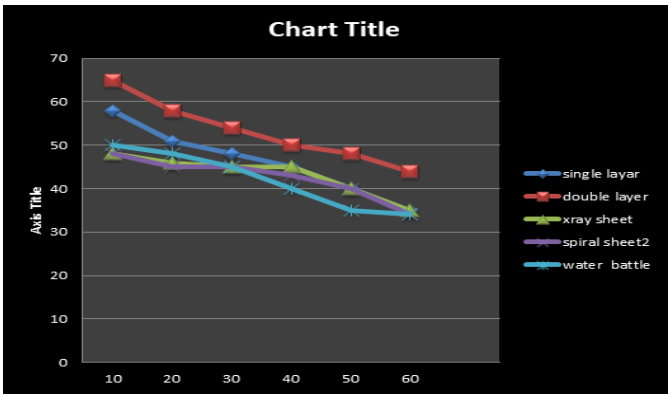

Figure 7.2: Output Graph (Temperature Vs Time)

7.2 DOUBLE LAYER CONCEPT

After the successful results of the polyethylene testing the next step we have taken is to increase the efficiency both in the way of increasing the temperature and reducing the heat loss. Hence we have gone for the double layer concept of using two layers of polyethylene sheets with the small gap in between them which increases the efficiency as expected

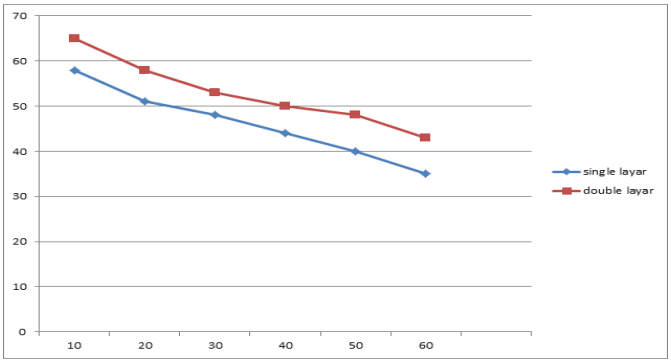

Figure 7.3: Graph for the difference of heat loss (Temperature Vs Time)

VIII. DESIGN METHOTOLOGY

8.1 MECHANICAL CONSTRUCTION

The mechanical part should be consist to have an various system like frames, tray system, cover sheet; base board etc., which is increased the strength of the product and also it should be protect from the various atmosphere condition.

8.1.1 Frames

Frames are made up of mild steel which is made into a hexagonal shape and it has less weight and high thermal conductivity that increases the thermal stability of the dryer. The steel frame is painted silvery for its high reflection property. It is separated into three parts which are show on below.

1. Top frame
2. Bottom frame
3. Centre frame

8.1.1.1 Top Frame

It is made by mild steel square bit pipe (1*1) which is fixed at top the dryer, has an exhaust fan. It provides the roof of the setup.

Figure 8.1: Top frame of the solar dryer

8.1.1.2 Bottom Frame

It is also made mild steel square bit pipe (1*1) which is fixed at bottom of the dryer. It is used for provide an air inlet of the dryer. The extra outlet gives the support for the heater to carry on.

Figure 8.2: Bottom frame of solar dryer

8.1.1.3 Central Rods

The central rods are used to connect the -top frame and the bottom frame and it provides the support which carries the tray. The doors are provided at the central rods using a door clip and prevent the shaking of the setup.

8.1.2 Tray System

The tray is designed according to the shape of the frame to cover the maximum area. Along with that, the adjustable handle is provided with the extra spacing.

Figure 8.3: Trays

8.1.3 PVC Sheets

The PVC [7CH2- CH2-CH2-CH2-] Sheet is selected for the project because of the following properties such as,

- Low cost
- Flexible
- Melting point is 115℃
- Good transparency
- Lower density and less weight
- Chemically inert

8.1.4 Card Board:

The bottom frame is covered by the cardboard with the black surface to absorb more heat inside the setup during the day time.

Figure 8.4: Card board

8.1.5 Rolling Wheels

The wheels are used for the portability. It reduces the risk of lifting the setup for transporting. It can carry the weight of nearly 250Kg. It is more reliable as it is made up of iron.

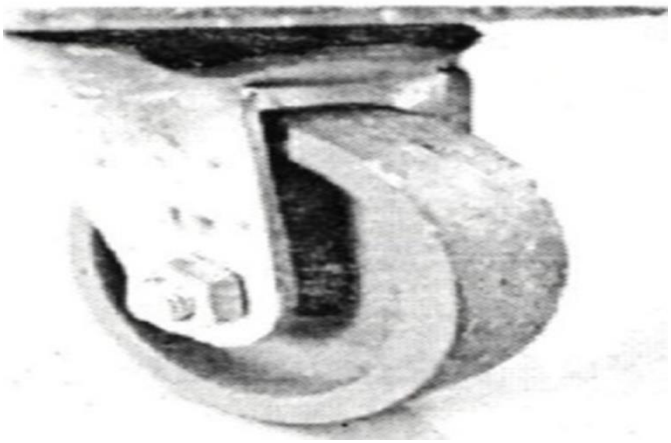

Figure 6.5: Rolling wheels

8.2 ELECTRICAL SYSTEMS

8.2.1 Controller

controllers are used for controlling the specified operation which is used to control and maintain temperature within the limit.

8.2.1.1 Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers students, hobbyists, artists, programmers, and professionals - has gathered around thisopen-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

8.2.2 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

The first relay is used in long distance telegraph circuits as amplifiers they repeated the signal comes from one circuit to another circuit. Relays were used extensively in telephone exchanges and early computers. to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contractor. Solid-state relays control power circuits with no moving parts, instead using a. semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

When an electric current is passed through the coil it generates a magnetic field that activates the armature and the consequent - movement of the movable contact either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position.

Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relay are manufactured to operate quickly. In a low voltage application this reduces noise in a voltage or current application it reduces arching.

When the coil is energized with direct current, a diode is often place across the coil to dissipate the energy from the collapsing magnetic field at activation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Such diodes were not widely used before the application of transistors were easily destroyed by this surge. Some automotive relays include a diode inside the relay case.

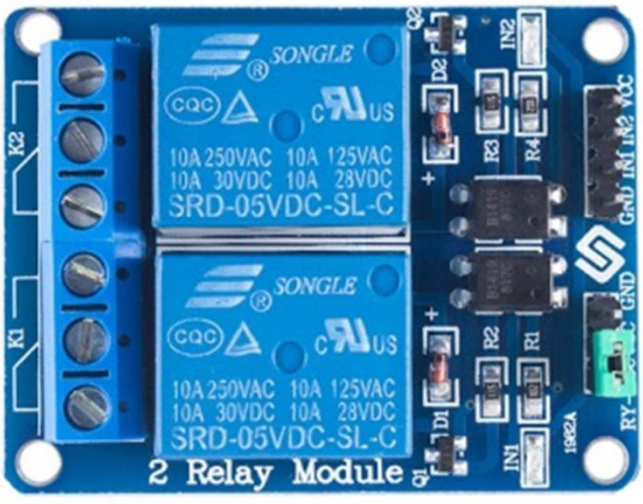

Figure 8.7: Operating relays

8.2.3 Sensor

LM35 is a precision IC temperature sensor with its output proportional to temperature (in C). The sensor circuitry is sealed and therefore it is not objected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self generating and does not cause more then 0.1 C temperature rise in still air.

The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every °C rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ °C.

8.2.3.1 Pin Diagram

The pin diagram of the LM35 sensor. is as following:

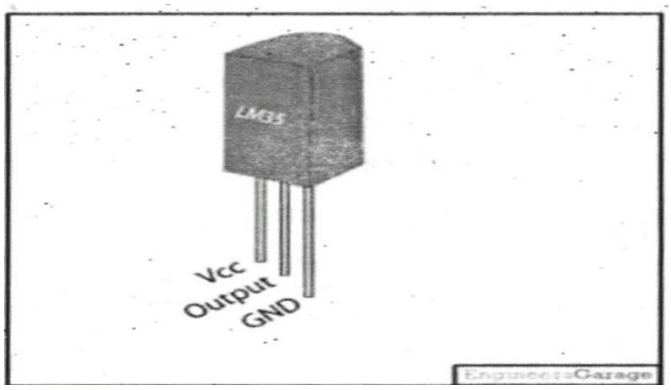

Figure 8.8: Pin diagram of LM35 sensor

8.2.3.2 Pin Description

The pin description of the LM35 sensor is as following:

Table 8.1: Pin description of LM35 sensor

PIN NO	FUNCTION	VOLTAGE
1	Supply voltage	5V (+35V to -2V)
2	Output voltage	(+6V to -1 V)
3	Ground	(OV)

8.2.4 Exhaust Fan

The primary purpose of exhaust fan is to remove the moisture content from vegetables, fruits, leafs, etc., on the solar dryer while drying. It's also used to circulating air for the purpose of maintained at constant temperature. The exhaust fan operating voltage is 12V and 0.75 Amps which operation is controlled by arduino using relay circuits.

8.2.5 Back-Up Heating System

Howeverthe conventional system is more convenient and eco-friendly the efficiency goes lower as the heat holding capacity of the polyethylene is comparatively lower than the other polycarbonates. Hence the heating system is provided with the automation, by the room heater. The heat is sensed automatically and it can be raised if it goes lower than the optimum (40°C) then the heating system is switched ON, which using nearly 10KWh of energy. Also the maximum limit of the temperature is set as 55°C and the heating system is allowed to switch OFF and runs the exhaust fan automatically. Thus the temperature is maintained inside the chamber in all the climatic conditions.

IX. RESULTS AND DISCUSSON

From the analysed data, the temperature change inside the chamber is corresponding to the outer temperature. But the surface of polyethylene sheet does not experience the temperature instead of that the inner space only holds the heat. Hence the quality of the polyethylene sheet is maintained for longer periods. The air ventilation should be comparatively lower than the actual polycarbonate solar dryers, for maintaining the heat. The heat is high at the top and comparatively low at the bottom. The sliced fruits and vegetables are more preferable for this dryer. There are some sampled data and tested samples given below which have been dried in the solar dryer.

X. CONCLUSION

Bio-electricity generation was achieved using waste fluted Betel Leaves Along With Nuts using MFCs technology. Another positive outcome of this study was waste reduction. The quantity of substrate used

in each batch reduced considerably leaving mostly water and a minimal quantity of decomposed agri waste. The water in the container used as the fuel cell was clearer than it was at the start of each process which shows that while electricity was being generated, the microbes were also treating the organic waste. The research work involved the use of discarded 1.5V dry cells as the electrode materials thereby converting waste to wealth using the 12kg substrate was capable of powering a 2.0V bulb. The benefit of this study is that it is cost effective. It will ensure the continuous removal of these vegetable wastes and their use for bio-electricity generation.

As a result of this newly designed solar dryer, it is evident that this model -designed with the highest possible thermodynamics efficiency. It makes an efficient role in drying of fruits in a successful way with commercialization aspects. There will be a continuous improvement in every technology for the betterment of people convenience. Here it was observed that solar dryer designed to perform realistic better than any dryers in cost wise and flexibility wise. The performance of these dryers could lead itself to in small scale business enterprises. Incorporate the ideas for the future black layer inside the two layers of the polyethylene sheet. The ultimate aim of this project is to dry the fruits by using the solar energy as a mutual source and to the equivalent model to the poly carbonate dryer. Moreover, it is economically preferable-to obtain the utmost quality of the dried products in many folds.

XI. REFERENCES

[1]. Mohanraj, M. and Chandrasekhar, P.(2009) "Performance of a forced convection solar dryer integrated with. gravel heat storage material for chili drying", Journal of engineering science and technology, vol. 4 (3) pp 305 314.

[2]. Bek, M.A. et al., (May 2014) "Drying Nerium Oleander in an Indirect Solar Dryer Using Phase Change Material as an Energy Storage Medium", Journal of Clean Energy Technologies, vol. 3, pp 176-180. .

[3]. Jain, D. and Tiwari, G.N. (2004) "Effect of greenhouse on crop drying under natural and forced convection 1: Evaluation of convective mass transfer coefficient", Energy conversion and management, 45, 765-783.

[4]. Tiwari A (2016) A Review on Solar Drying of Agricultural Produce. J Food Process Technology 7: 623. doi: 10.4172/2157-7110.1000623.

Working flow chart: