AUTOMATIC WASTE FOOD COMPOSTING USING SOLAR ENERGY

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Abstract: Waste food has been a major concerning topic nowadays. Food that is wasted and put into garbage can be easily converted and used as compost for plants through this project. Also the decomposition of waste food which consumes large period of time is reduced and the energy used for conversion is harvested from solar system. So basically, this whole project is taking solar energy and using it to convert the organic waste in compost for better fertility of plants in less amount of time. When the waste food is inserted into the feeder, the food is been crushed into smaller pieces by the crusher. When the waste level exceeds the pre-decided level, the level detector will sense it and pass the signal to micro-controller. According to the information given by the humidity and temperature sensor the micro-controller will decide the period of time for which the heater should be ON. The heater will heat the material and make it dry. This dry material is compost ready to be used as fertilizer in plants. The gases which are produced during heating process are passed through a condenser where vapour's are condensed and converted into distilled water which can be used in batteries. The whole energy required for crushing, heating and controlling is done by the solar energy harvested from the solar panel.

IndexTerms - **Solar Panel, PIC16F877A Microcontroller, IR Sensor, DHT22 Sensor, LM3914.**

I. INTRODUCTION

'**Swachh Bharat Abhiyaan**' is a national campaign initiated by the Government of India, which covers 4,041 cities and towns, to clean the streets, roads and infrastructure of the country. The main motto is to create a sustainable development and create awareness about the impacts of improper waste disposal. In a country, 300 to 400 grams of solid waste per person per day is generated in a town of normal size. In cities like Delhi and Mumbai, the figure is almost 500 to 800 grams per person per day. Waste management and its disposal is day by day becoming a massive and expensive problem to the authorities especially in cities where concrete jungle is increasing rapidly. In a country, organic waste constitutes almost 35% of the total waste, disposing of at least the household organic waste at source, can create a positive impact in the domain of waste disposal. If this disposal is reused efficiently, can prove to be a useful material. This project focuses mainly on improving the drawbacks of the existing scenario. Currently, problems are encountered when potential customers are shut out of the composting technologies owing to expensive, space consuming and complicated methods of composting solutions offered by large vessel capacity organic composters as opposed to what is normally required by a domestic household. The six to eight month natural composting process poses problems due to the consumption of time for composting and maintenance of the composting process. In this project, the waste food is crushed into small pieces which will help in rapid heating. According to the humidity and temperature, the time duration will be fixed for heating which will reduce more consumption of power. The micro controller is used for automation. The LCD (Liquid Crystal Display) will show the current ongoing process so that it will become user friendly and easy to use. As the energy will be extracted from the solar panel, the device becomes portable and can work effectively. This project will overcome the drawbacks of the big machines used in similar way. The output will be a ready compost, a manure for the growth of plants and crops. In this way the waste food can be used in a useful and productive way at a domestic level too efficiently.

II. PROBLEM STATEMENT

Organic waste creates pollution to our surrounding and thus naturally it tries to decompose the waste and the process takes longer duration. While decomposing solid waste gets decomposed and pollutes the atmosphere, in order to overcome these issues our project is solution to these problems. To decompose waste here we not need to travel waste to the decomposing ground, in fact we can directly decompose the waste in this device.

III. BACKGROUND & LITERATURE REVIEW

This chapter investigates some researches in the following papers :
3.1. Home Composter: It is a domestic use composter. Here they have used the technique of vessel composting. The design of the end product is user friendly and kitchen bin can be replaced in a productive way. Bin provides favourable conditions for compost to be formed in a rapid way. They have used the Bioculum product. [1]
3.2. Converting food waste to usable energy in the urban environment through anaerobic digestion: In this paper they have used a process of anaerobic digestion in which microorganisms break down biodegradable material in the absence of oxygen. For

food waste, studies show that at 35C mesophilic digestion is most stable and 55C thermophilic digestion allows faster methane extraction. This paper helped in studying the procedure of waste food decomposition in a proper conditional way. [2]

3.3. Experimental Investigation of Biogas Production from Food Waste and Analysis for the Waste Energy Recovery and Utilization from Institutions of state of Tamil Nadu in India: This paper states the experimental behaviour of the biogas which is released from kitchen waste. This gas has a great potential to be an alternative fuel. There main objective was to utilize the kitchen waste in a bio digester to produce biogas which will be the alternative fuel for their kitchen energy need. Through observations and experimental tests, they realized that bio gas can be used again in a productive way. [3]

3.4. Ammonia Emission Control for the Management of Food Waste through Composting Model: This article developed a nitrogen model of composting combined Contis Function. The model was validated by experiments. They have used MATLAB for programming purpose .More study needs to be done on the nitrogen conversion in composting. [4]

3.5. Automation of smart waste management using IoT to support "Swatch Bharat Abhiyan": The main motto of this application is collection of dry and wet waste separately which placed in a conveyor belt on which the dry waste collected dustbins are placed left side and wet waste collected bins on right side. [5]

3.6. Can crush an automated waste composting system for public areas: Juan Becker et.at published a paper on 'Can crush an automated waste composting system for public areas. In this paper the author design a prototype for composting an aluminium can by a mechatronic machine. They design their prototype specially for aluminium cans. The results show that they compress the size of can by 70.1. [6]

3.7. The effect of different mixing ratio on composting Yard trimming and foul waste: Wei Yang et.at presented a paper on 'The effect of different mixing ratio on composting Yard trimming and foul waste'. The author try to improve the composing process by different mixing ratio. [7]

3.8. Microcontroller based household anaerobic food digester in IEBF conference: VishwatmaOree et.al presented a paper on a microcontroller based household anaerobic food digester in IEBF conference. In this paper a two stage anaerobic digester is developed to manage food waste at household level. The output or digester is biogas and compost. [8]

IV. PROPOSED SYSTEM

A. BLOCK DIAGRAM
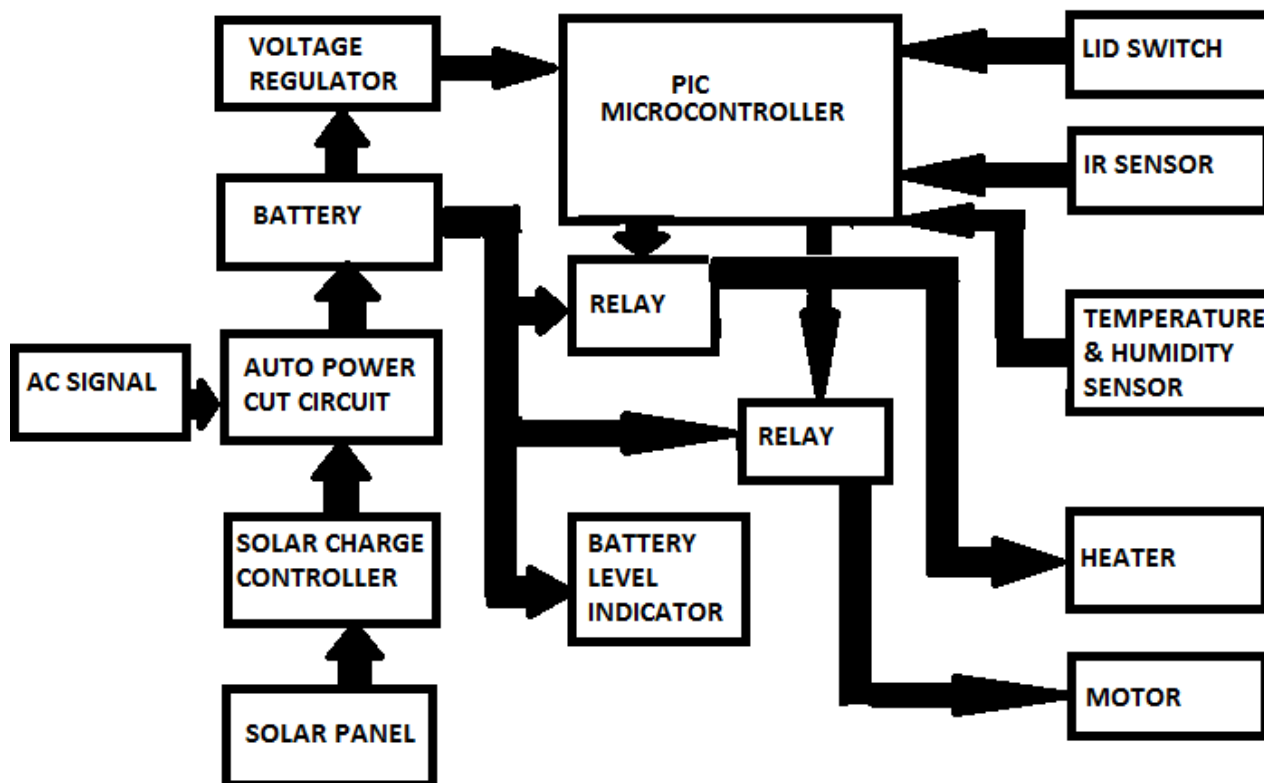
Fig No.4.1 Block Diagram of Waste Management System

Using solar panel we can extract the energy from sun and it gets stored in the battery. From Fig No: 4.1 we can see that current limiter is set in order to protect battery from back current from heater and crusher. Micro controller is the heart of the system

and thus each and every process is controlled and managed by microcontroller.

Humidity and temperature sensors are used to sense temperature and humidity of the material inside the chamber. Using LCD display we can watch around which process is going on. Waste collected is then crushed using a crusher and is then transferred to heating chamber were all the crushed waste is heated and the moisture from the waste is exhausted in the air
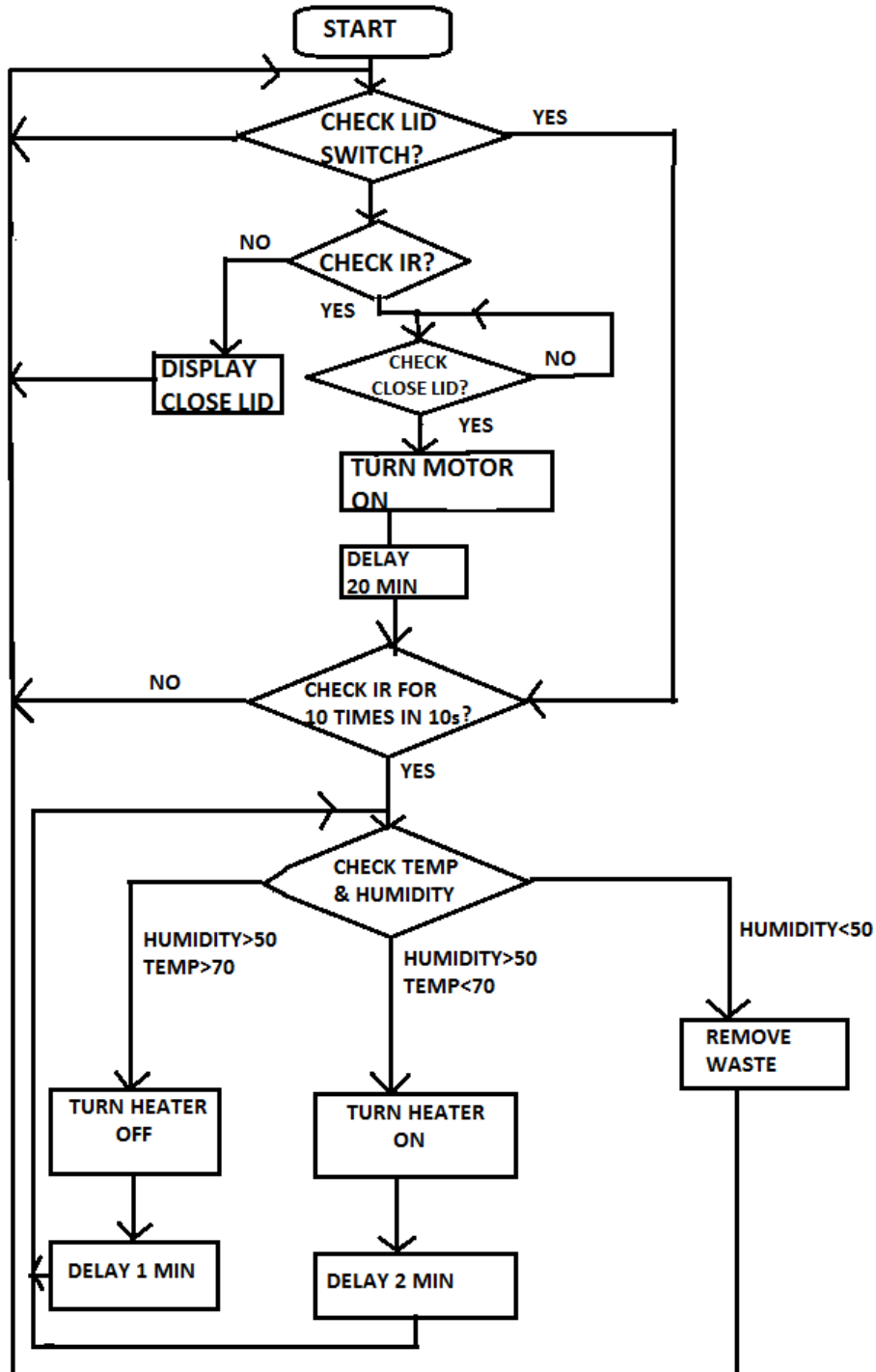
B. FLOWCHART

Fig No: 4.2 Flowchart of Code in microcontroller

From the Fig no: 4.2 we can see that the waste is entered through the feeder in crusher and IR sensor checks whether the waste is set for further process , if Yes then the crusher motor ON if No then crusher motor is in OFF state. Again IR sensor checks

for the level required for waste collected. If Yes, then heater gets ON and if No then heater remains in OFF state.

Now temperature and humidity sensor checks for the temperature and humidity of collected waste, if it reaches to a predefined level the heater enters in OFF state and will get waste ready for compost else it will again start heating the waste.

V. MODEL DESIGN

**Fig No: 5.1 Model DesignFig No: 5.2 Overview of Model Design**

The above fig no. 5.1 and 5.2, shows the model design of the main waste composting chamber. The motor is placed at the top with the shaft attached to it. The blades are performing two tasks: a. crushing and b. mixing. This model has a manual door at the bottom for removing the dry waste after the process ends.

VI. RESULTS
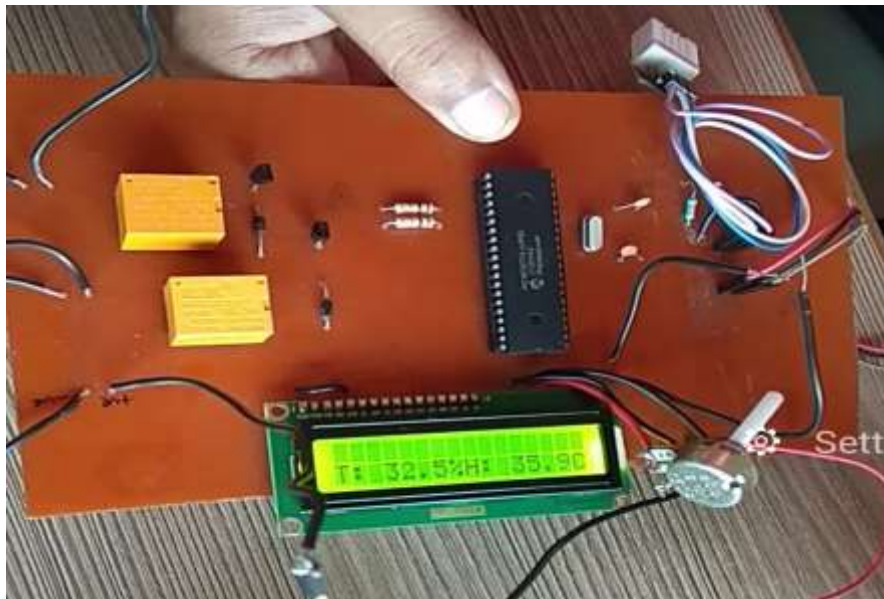
Fig No: 6.1 Temperature & Humidity Output

Above Fig No: 6.1 shows the temperature and humidity count of solid waste which is present in heating chamber. Using temperature and humidity sensor (DHT22) we can sense the temperature and humidity of solid waste and display the count using LCD with the help of microcontroller PIC 18F 4550.
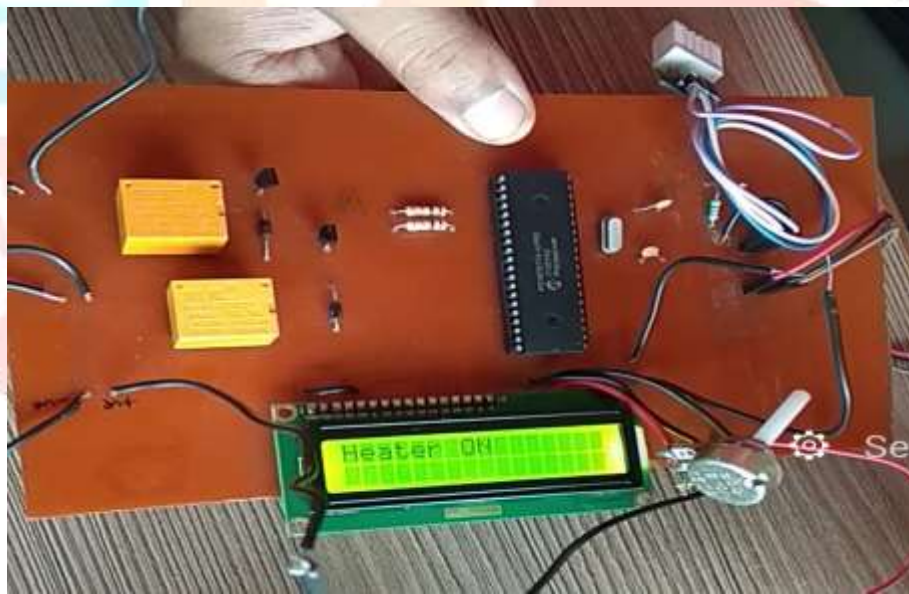
Fig No: 6.2 Heater Output

Above Figure No: 6.2 shows the Heater Output. Using IR sensor we can check the level of solid waste which is present at heating chamber, if the waste reaches till predefined level heater get turn ON.

Fig No: 6.3 Expected Output

The Fig No 6.3 shows the expected output after the process and before process where waste food is processed in the machine and after that it is ready to be used for making compost.

VII. CONCLUSION

This research concludes the gas level detection of each waste materials, discusses dumping and separating each type of wastages by using motor. Also, it describes a sophisticated technique for sorting the waste based on low-power controller of microcontroller which uses gas sensors to separate the compost and raw wastes to garbage management system. The method reduces the consumption of natural resources and lowers the ultimate waste disposal needs. The result of this work explains that a Microcontroller based Automatic Waste Management Sorting Unit provided an efficient system for sorting wastes into various component.

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