AUTOMATIC FOOD DRYING SYSTEM

Mr. A.B.KUMBHAR
Ass. Prof. Department of Electrical Engg. S.G.I. Atigre, kumbhar.ab@sginstitute.in

MS. SALUNKHE SNEHA N.
Department of Electrical Engg. S.G.I. Atigre snehasalunkhe369@gmail.com

MR. PATIL TEJAS ARUN
Department of Electrical Engg.S.G.I. Atigre tejaspatil070@gmail.com

MS. JARAG VINAYA V.
Department of Electrical Engg. S.G.I. Atigre vinayajarag963@gmail.com

MR. MAGDUM SANKET B.
Department of Electrical Engg. S.G.I. Atigre sanketmagdum1008@gmail.com

MR. GAVANDI OMKAR S.
Department of Electrical Engg. S.G.I. Atigre, omkar.gavandi.88@gmail.com

ABSTRACT

Fruit drying system project mainly based on the drying of the dry-fruits. In today world due to increases of population demand of dry-fruits are increased. So that point of view we need to dry fruit in the short duration. In conventional sun drying process more time is required for the drying of the fruit. So we can use fruit drying system. In this system consist one metal chamber to drying fruit. The air is blown inside the chamber and exhaust fan are placed to air in and out. The nickel chrome coil is used for the heating purpose of the chamber. By using microprocessor we can control all the process like the heating of the coil, sensing of the metal body temperature and the humidity control. The automatic fruit drying system is very applicable for the drying fruit in the short duration of the time. Fruit drying system project is mainly based on the agriculture field.

KEYWORDS: Dryer, Microcontroller, Sensors, Exhaust fan, Display

I. INTRODUCTION

Due to the more demand of the dry-fruits we need to supply dry-fruits in a short duratation of time. Also wet fruit can be damaged in a very little time. To avoid the damage of fruit and save the time of fruit drying we design the automatic fruit drying system. In this system fruits are drying in the very short duratation of the time and it is very easy to transport dried fruits from one place to another place. Dehydration is most important thing used for the lower cost of packing , storing and the transportation purpose to reduce the weight and volume of the product. When the fruits are dehydrates then fruits are preserved for the longer time as compared to the wet fruit. When fruits are drying in the direct sunlight at that time the external parameter like a dust , dirt and the rain affect to the that fruits. Also manpower required for the conventional drying unit process is more ,as compared to the this fruit drying system. In this fruit drying system the time as well as manpower required is very less. The product ensure the best quality if the dry fruits. The strict and accurate control of each and every process gives best product quality. In the rainy day fruit dry in the sunlight is very difficult. But using this system we dried fruit in the rainy day also. No any external parameter can affect on the drying of the fruits in this system.

II. METHODOLOGY

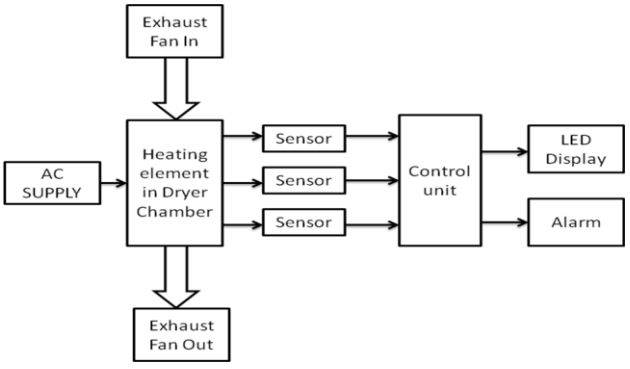

Fig. [1] Block Diagram

The process of drying the fruits involves removing moisture from the fruits by the external drying parameter. Maximum 80 % of the moisture can be removed from the drying of the fruit. To calculate heat required to dry the given fruit can be calculated as by using the following equation.

$$W1 (100-M1) = W2 (100-M2)$$

Where W1 is the weight in the kg of the fresh fruit and the M1 is the initial moisture in the fruit. W2 is the weight in the kg of the dried fruit and the M2 is the finial moisture in the dried fruit.

The ardino based ATMGA08 microcontroller are used for the controlling purpose and manage overall fruit drying system. Different fruits are the different temperature to dry the two thermostats is used to set the required temperature by manually. Three sensors are connected to the chamber. The temperature sensor LM35 can sense temperature of the cabinet in which fruit is dried. A display is used to see process continuously for the temperature and the time reading. The humidity sensor is used for to know the moisture in that particular fruit. In the programmers we compare the humidity of fruit and set value and according to that microcontroller works.

III. OPERATION

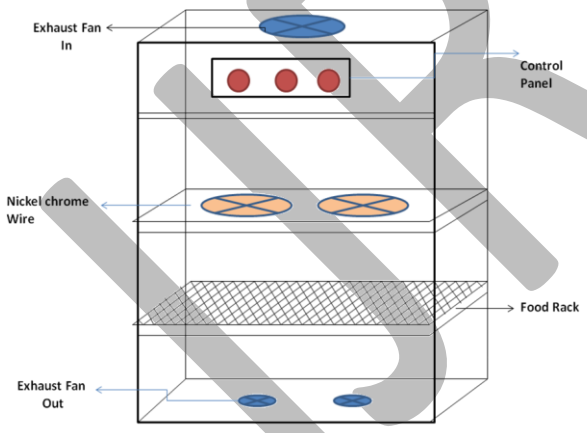

Fig.[2] General view of drying chamber.

The AC supply is given to the drying chamber. In the drying chamber exhaust fan is fitted on top and next to the exhaust fan there are two coils of nickel chrome of the rating 1200 Watt and the 1500 Watt are placed in the chamber. The operation of that coil is controlled by the using thermostat. According to the fruit we give different temperature to the coil via thermostat. The hot air is circulated in the chamber by using the exhaust fan. For controlling overall process we use the different sensor LM 35 sense the temperature and the moisture sensor sense the R-h value.

IV. CIRCUIT CONSTRUCTION & WORKING

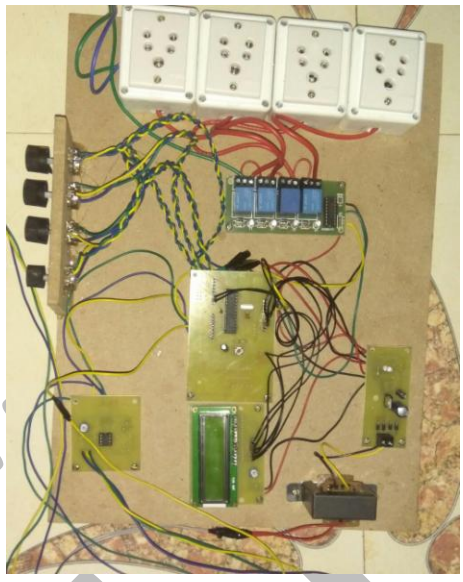

Fig. [3] Microprocessor configuration with driver circuit and sensors.

The 5 volt power supply given to the microcontroller unit. The microcontroller PIC16F87XA is used, having 28 pins. Once unit is turn on, reference temperature is set to get good quality of dried fruit. The temperature is continuously sensed by the temperature sensor LM35, which does not require external calibration at room temperature during temperature range (50ºC to 300°C). Three sensors are mounted to different place of cabinet with PIC16F87XA microcontroller configuration. Based on the comparison of the three references temperature value and the average of three sensor value fans will be run to glow in the air in the chamber. The hot air created in the chamber, passes over the trays where it comes in contact with surface of dried fruit carries the moisture. So the humid air, carried out through the moisture exhaust. There are two temperature sensor IC we used.

Fig.[4] Constructed Metal Cabinet

Thermostat is connected in series with the coil as shown in figure [4]. The coil temperature is set with the thermostat in between 50° C to 55° C . There are two coils are used with two thermostat. So we can set the temperature in between 50° C to 55° C. Ones the required temperature is get in cabinet one of the coil get turn off. That mean the temperature is never reduced bellow low temperature which we set with the help of thermostat of coil.

V. RESULT

The drying chamber is a metal box with dimension length 3 feet, height 3.93 feet and width 2.00 feet. Distance between each plate is 7 inch. Distance of the first plate from top is 8 inch and the distance of the last plate from the bottom is 6 inch for the proper circulation of the air. The fan is connected to the upper and lower side of the chamber. Two thermostat are connected to the chamber for sensing the chamber temperature. Experiment was conducted and the drying unit was tested by taking grapes and grapes as a sample fruit. Test was conducted for a day and the result of moisture content and the time where recorded. A graph was plotted shown in the figure. The moisture in the fruit with respect to the time in the natural drying process is compared with automatic food drying unit. It was observed that automatic drying unit gives better performance in terms of drying rate as compared to the natural drying process means by conventional method. The temperature and humidity are dependent on the user requirement. Humidity gradient to remove the water content in the fruit was varied by the varying fan speed. It was observed that temperature gradient plays an important role in the initial period of the drying process, and the humidity gradient plays important role in later part of the drying process to avoid the caramelization.

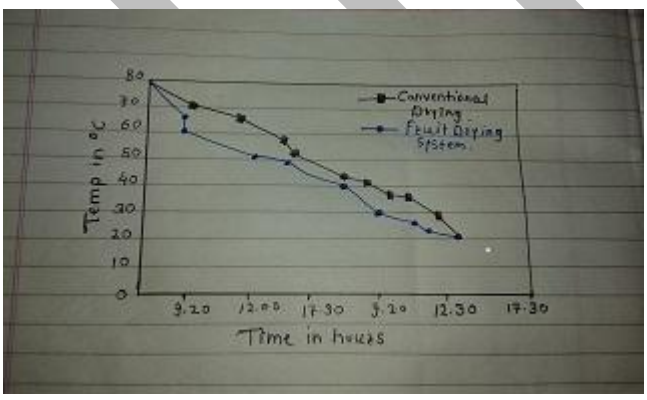

Fig [5].Temperature verses Time curve.

VI. CONCLUSION

Time require to dry the food is less than conventional method. The systems require low space, minimum installation time. Unit can be available in varied capacities. Dust and dirt are dose not contact with food thereby ensuring good quality of the dried product. The system can be made more economical by making provision for drying variety of fruits in a single unit. It is very economical for farmer. Instead of AC supply also gives solar supply to this drying system. This can be used for seafish.

VII. ACKNOWLEDGMENT

I would like to express my great appreciation to Prof. Mr. Jonah Tayade for his encouragement and guidance, timely suggestions during the completion of the project. The discussions held with him during the research work, which helped me a lot in materializing this dissertation work and also to grow up our knowledge. My sincere thank also to prof. Rajendra Bhosle for there guidance about technical work. We also thankful to all persons, for there direct indirect help and for their valuable suggestion and comments. We thankful for the constant moral support of our friends and family without which this work has been impossible.

REFERENCES

1) Experimental Research of Grape Drying Using Solar Dryer with Latent Heat Storage System.
2) Solar Powered Automatic Fruit Drying System Mr. Patil Kiran , Ms. Swami Sonam, Ms. Thorat Ashwini, Ms. Mane Pratidnya ISSN: 2278 – 909X International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 5, Issue 3, March 2016 735 All Rights Reserved © 2016 IJARECE
3) The Raisin Drying Process L. Peter Christensen And William L. Peacock
4) Yunus A. Cengel, "Heat Transfer - A practical approach", WCB McGraw-Hill 1998