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SOLAR OPERTED BANANA CHIPS CUTTING MACHING

[1]Faizanahmad Mujawar, [2]Sourabh Motugade, [3]Rushikesh Mali, [4]Dhanashri Hankare, [5]Prof. S. N. Hublikar

[1,2,3,4]Student, Department of Mechanical Engineering, ATS SBGI MIRAJ, pan INDIA)
[5]Professor, Department of Mechanical Engineering, ATS SBGI MIRAJ, pan INDIA)

ABSTRACT

A power operated rotary banana slicer suitable for small scale processing was designed anddeveloped based on engi-neering properties of banana varieties, namely Nendran and Dwarf Cavendish. This banana slicer mainly consists of feeders for round slicing, cutter, power transmission mechanism, base support and frame. The power operated rotary slicerwith three blade cutter that was operating at 360 rpm speed was developed to overcome drawbacks of existing hand or power operated rotary slicers and to meet the demand of small scale processing industries. This slicer has slic-ing efficiency of about a 93–94% with effective capacity of about 100 kg/h for both varieties. The mean thickness of cut forboth varieties was about 2.00 ± 0.194 mm, whereas mean roundness was of 0.84 and 0.70for Nendran and Dwarf Cavendish varieties respectively.

It is originated in hottropical regions of south-east Asia. India ranks first in production of mango (40%) andbanana (17%) of world pro-duction. India is the largest producer of banana and plantains in the world with a production of 16.82 million t from an area of 0.49 million ha. In Indiait accounts for 33% of total production of The Indian average productivity is 34.3 t/ha while the highest productivity within India isin Mahar-ashtra with productivity of 60 t/ha followed Tamil Nadu with 53 t/ha (Anonymous 2005) Banana is a tropical plant, requires warm humid climate. It can grow successfully at sea level to an altitude of 1,500 m. A mean temperature of 26.7°C and rainfall of 100 mm/month aresatisfactory for its cultivation. Deep, well drained, friable, loamy soil with adequate organic matter is the ideal con-dition for its cultivation

Keywords *: banana; power operated slicer; round slices; effective capacity; slicing efficiency*

INTRODUCTION

Solar energy is one of the most important renewable energy sources that have beengaining increased attention in recent years. Solar energy is plentiful; it has the greatest availability compared toother energy sources. The amount of energy supplied to the earthin one day by the sun is sufficient to power the total energy needs of the earth for one year.Solar energy is clean and free of emissions, since it does not produce pollutants or by- products harmful to

nature. The conversion of solar energy into electrical energy has manyapplication fields. Recently, research and development of low cost flat-panel solar panels,thin-film devices, concentrator systems, and many innovative concepts have increased. In the near future, the costs of small solar-power modular units and solar-power plants will be economicallyfeasible for large-scale production and use of solar energy.

Banana is a tropical plant, requires warm humid climate. It can grow successfully at sea level to analtitude of 1,500 m. A mean temperature of 26.7°C and rainfall of 100 mm/month are satisfactory forits cultivation Deep, well drained, friable, loamy soil withadequate organic matter is the ideal condition for its cultivation.

A solar power operated rotary banana slicer suitable for small scale processing was designed and developed based on engi-neering properties of banana varieties, namely Nendran and Dwarf Cavendish. This banana slicer mainly consists of feeders for round slicing, cutter, power transmission mechanism, base support and frame. The power operated rotary slicer with three blade cutter that was operating at 360 rpm speed was developed to overcome drawbacks of existing hand or power operated rotary slicers and tomeet the demand of small scale processing industries. This slicer has slic-ing efficiency ofabout a 93–94% with effective capacity of about 100 kg/h for both varieties. The mean thickness of cut for both varieties was about

± 0.194 mm, whereas mean roundness was of 0.84 and 0.70 for Nendran and Dwarf Cavendish varietiesrespectively.

LITERATURE REVIEW :

1. Huynh D.C & et : This paper proposes an advanced perturbation and observation (P&O) algorithm for tracking the maximum power point (MPP) of a solar PV panel. The obtained simulation results are compared with MPPs achieved using the conventional P&O algorithm under various atmospheric conditions. The results show that the advanced P&O algorithm is better than the conventional P&O algorithms for tracking MPPs of solar PV panels. Additionally, it is simple and can be easily implemented in digital signal processor (DSP) 2. Grzesaik. W. MPPT Solar Charge Controller The work deals with a PV battery charge regulator assigned for advanced CdTe modules of output voltage much higher than the popular values of the order 12 or 24 V nominally. As at the same time most of the nominal PV autonomous installation voltages generally remain on the 12 or 24 V level because of convenience, technical tradition and battery features- this high DC module's voltage has to be transformed to a proper lower value by means of DC/DC inverter of possibly high efficiency The choice of MPPT algorithm and its realization by means of microprocessor are explained and discussed as well as final test and measurement results. Very satisfactory exploitation results permit to estimate the solution as a valuable one for the new high voltage modules'market.. 3 Petchjatuporn. P and et. This paper presents the development of a maximum power point tracking algorithm using an artificial neural network for a solar power system. By applying a three layers neural network and some simple activation functions, the maximum power point of a solar array can be efficiently tracked. The tracking algorithm integrated with a solar-powered battery charging system has been successfully implemented on a low- cost PIC16F876 RISC-microcontroller without external sensor unit requirement The experimental results with a commercial solar array show that the proposed algorithm outperforms the conventional controller in terms of tracking speed and mitigation of fluctuation output power in steady state operation. The overall system efficiency is

well above 90%. 4 Longxi. Chang & et. all. fully integrated solar charger controller is presented in this paper. The charger has wide input voltage range about 10V to 28V for the solar-powered panel. The input loopregulation is used here as the MPPT protection. This charger also provides different kinds of battery voltages about 4V to 12V. fully integrated solar charger controller is presented in this paper. The charger has wide input voltage range about 10V to 28V for the solar-powered panel. The input loopregulation is used here as the MPPT protection. This charger also provides different kinds of battery voltages about 4V to 12V.

PROBLEM STATEMENT & OBJECTIVES :

To design solar operated banana chips making machine.

Objectives :

- To reduce electricity bills.
- Design and fabricate banana chips making machine on solar.
- Design compact size.

MATERIALS & METHODS :

1] Micro Controlar Unit (MCU) :

The MPPT control circuit is implemented in a microcontroller, that has eight 10-bits analog-to-digital (A/D) converters and two four PWM mode signals. The buck converter is controlled by the microcontroller.. The control circuit compares the PV output power beforeand after a change in the duty ratio of the DC/DC converter control signal. It is expected that the MPP presents a constant oscillationinherent to the algorithm.

2] DC-DC convertor:

There are several topologies available for DC-DC converter. Among them buck converteris in an increasingly popular topology, particularly in battery powered applications, as levelof the output voltage can be changed with respect to input voltage. The commonly used a converter in PV systems is a DC/DCpower converter.

3] Maximum Power Point Tracking (MPPT) :

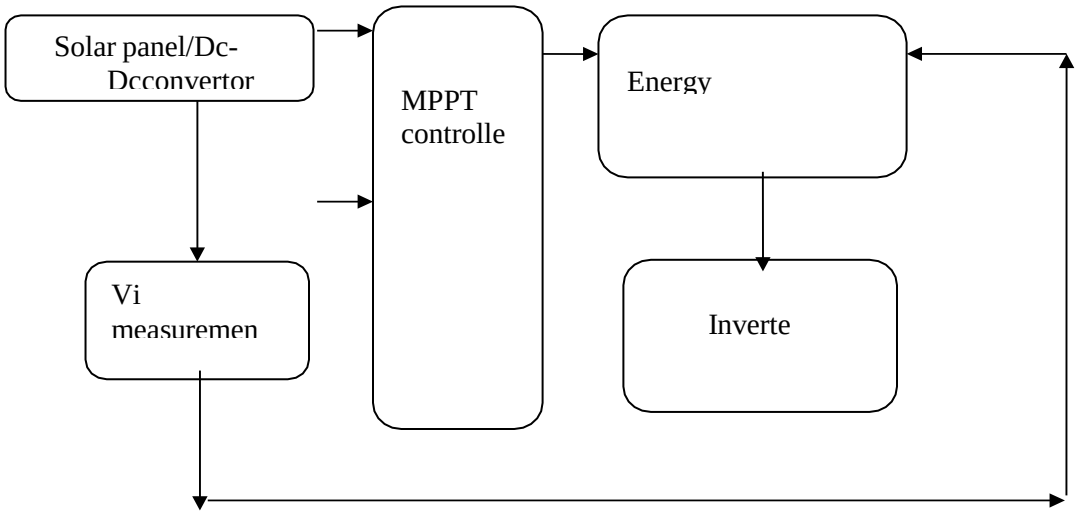
A typical solar panel converts only 30 to 40 percent of the incident solar irradiation into electrical energy. Maximum power point tracking technique is used to improve the efficiency of the solar panel. According to Maximum Power Transfer technique, the outputpower of a circuit is maximum when the source impedance matches with the loadimpedance.

4] Storage: storage device is 12v lead acid dry battery.

5] DC motor controller: it will control the speed of dc motor to be operated on solar forcutting ofbanana with the help of pulse width modulation.

WORKING PRINCIPLE :

Working of this project is very simple, we are keeping the project in sunlight to get solar rays easily on panels, which placed inclined on frame and convert the solar energy into electrical energy, but its not easy to give directy to the motar, for that purpose we using the charging circuit which mounted on frame, its charge the battery, then through the battery we are supply the electricity to dc motor and the speed of dc motor controlled by control system and finally cutterget the power from motor and we cut the our raw material that is banana in circuler shape chips.



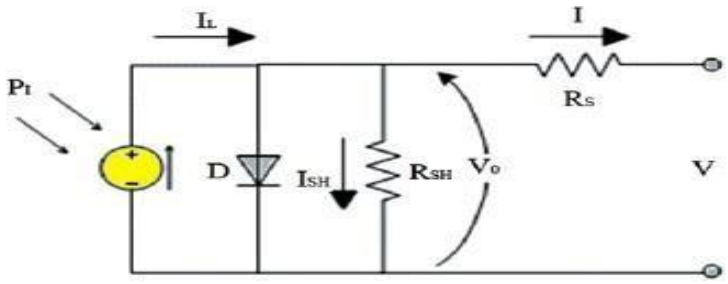
Methodology: Block diagram for tracker unit

SOLAR PANEL

Perturb and Observe

The main objective of maximum power point tracking is to read the voltage and current from the solar panel, perform the calculation for power and then display the power at its maximum. There are many algorithms available to execute this process. Some examples include Perturb and Observe (P&O), Incremental Conductance, Parasitic Capacitance andConstant Voltage Method. Of all the available algorithms, P&O is the most widely used algorithm because of its easy implementation. As for the Incremental Conductance method,it is more complex. However, a pro with this method is that it can bemore accurate than the P&O method. As for the Parasitic Capacitance, it is much more complicated since the effect of the solar cells' parasitic junction capacitance matters [14].

Fig. 1 Circuit of PV cell



PV PANEL

Fig 2 shows the current source and diode which are connected in parallel. PV array is designed by connecting number of solar cell in series and parallel. The specification of PV panel is decided as per the following.

$n_s = \frac{V_{DC}}{V_{OC}}$ --------- **(1)**

$n_p = \frac{P_{max}/V_{DC}}{I_{mp}}$ --------(2)

Where

Voc - open circuit voltage,Imp – peak current and Pmax – maximum power.

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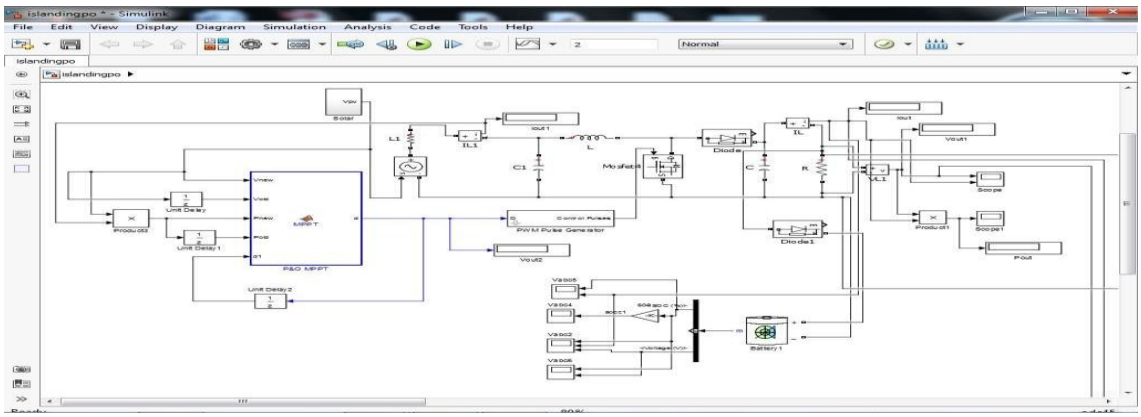
MAXIMUM POWER POINT TRACKING

The use of MPPT is the extracting the concentrated power at any environmental condition. Using the MPPT technique, definitely improve the efficiency of PV panel. Herewe are using perturbation and observation MPPT technique.

MPPT BOOST CONVERTER

Following figure shows the simulation model of the DC-DC converter. The input capacitor is compulsory to steady the input voltage due to the peak current must of exchanging power supply. Specification of inductor is very important which decided through the following equation



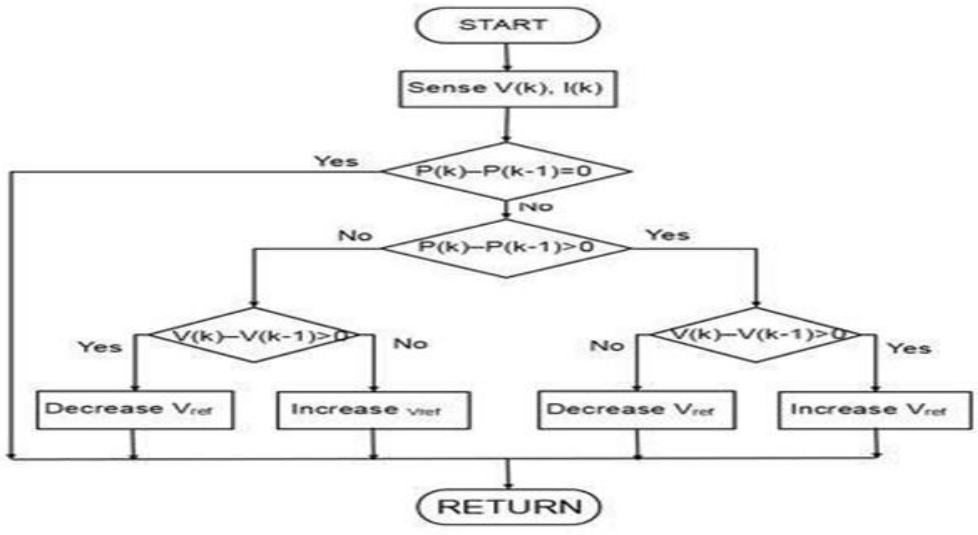


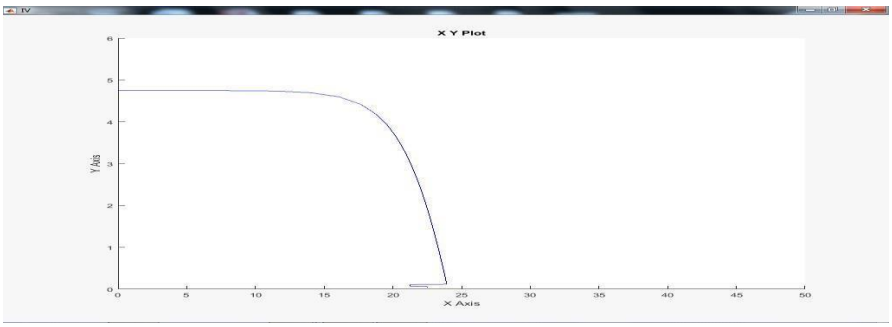
Fig.3 Mppt Boost Converter

Since the type of DC/DC converter chosen for this project is the buck/boost converter, it will step the input voltage down based on the duty cycle. The preset duty cyclefor the simulation is 50%, so the voltage from the input of the

buck converter will be reduced by half when measure the output of theconverter.

TYPES OF DC TO AC CONVERTERS

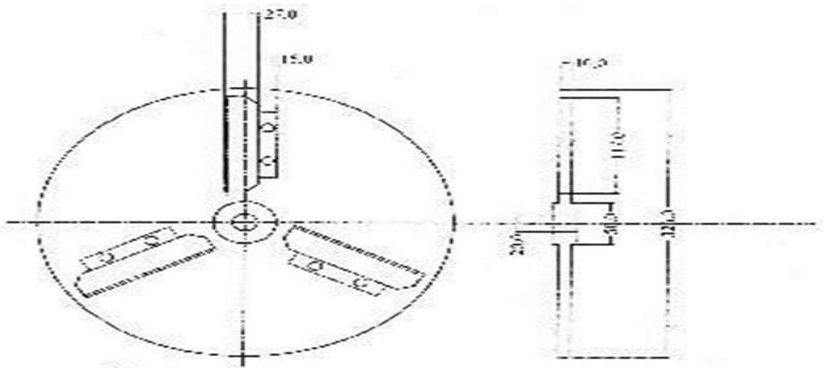
For this project we need a product that converts and regulates a certain DC voltagelevel to different DCvoltage level. There are many possible DC/DC converters that can achieve this condition, some examples of these converters are buck converter, boost converter, buck-boost converter, and the converter. A buck converter is a switching converter that operates opening and closing an electronic switch periodically, and it is a step down voltage converter since its output voltage is smaller than its input voltage. A boost converter is similar to the buck converter except it functions as a step up converter instead of a step down. Its output voltage is larger than the input voltage. As for buck-boostconverter, theoutput voltage can be either higher or lower than the input voltage. Lastly the cuk converter is similar to the buck-boost converter, the output voltage can be either larger or smaller than the input voltage



The instantaneous power delivered by the solar panel at each moment was calculated by measuring the output

voltage and current across the DC/DC converter and multiplying both quantities. This function executed in a loop so that it would be repeated and produced multiple power readings: P1, P2, … Pn, Pn+1. If the new power, Pn+1 is higher than the previous value Pn, then the operating voltage is compared.

CUTTING BLADE

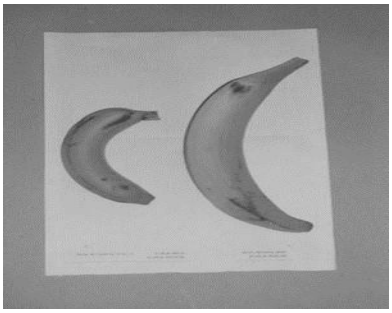


Cutting Blade

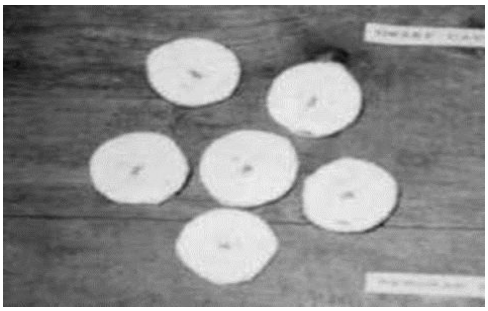
Design of a banana slicer requires the basic in-formation such as engineering properties ofthe green banana or required capacity of machine. As per the market survey conducted, thecapacityrequirement of small scale banana chip manufactures is about 80–100 kg/h. Therefore to caterthe need of manufacture the capacity chosen is 100 kg/h.

RESUITS AND DISCUSSIONBANANA SHELLING

Banana provides a well balanced diet compared to any other fruits and satisfies the definition of good food i.e. which is easily digested and absorbed in our body. It is one of the most popular fruit of India, which is relatively inexpensive staple food. It is consumedboth as ripe fruit and raw fruit and in the processed form. Banana processed products suchas wafers/chips are gaining wide popularity in our day-to-day life. There is tremendous scope of banana processing unit to flourish further with increased acceptance of snack foods. Thetech-nology of banana chips making was developed by Central Food Technological Research Institute (CFTRI), Mysore, India and suggested that two va-rietiesNendran and Dwarf Cavendish are good for makingchips (Fig. 1). Round slices are nothingbut transverse sections through the peeled banana.



Raw Material



Banana Chips

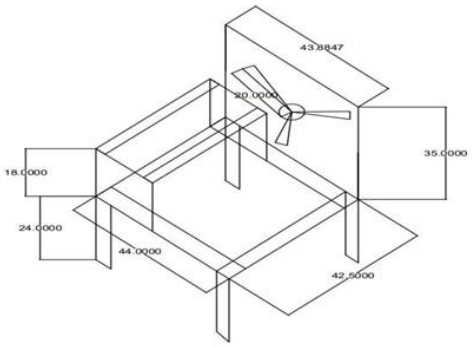
More than 90% of bananas produced in the country are consumed as fresh fruit. The processing ofbanana and plantains is only to an extent of 2–3% (estimated) . The origin of processing of banana/plantain in India can be traced back to its use as chips and panchamritham in Kerala for more than 100 years. Slicing is a cutting process for size reduction of fruits and vegetables; it involves pushing or forcing a thin, sharp knife to shear through the material. The result gives minimum deformation and rup-ture of the cell wall. Biological materials commonly subjected to cutting could be classified as:

1 non fibrous, liquid cell materials having uniform properties in all direction at the tim cutting

2 fibrous materials with high tensile strength fibers oriented in a common direction with comparatively low strength materials holding the fibers together.

3 In first category, the compressive stress applied by the cutting tool to the cell will cause pressure in thecell wall at the point of contact with cutting tool.

Fabrication and Drawing :



CONCLUSIONS :

1. The power operated rotary raw banana slicer was designed and developed. With thechosen machine speed of 360 rpm, the slicing efficiency obtained was 93–94%; it was acceptable for both varieties with optimum capacity 100 kg/h for three-blade cutter, which meets the requirements of small scale processing unit.

2. The best chip geometry was obtained at moderate speed of machine; the slicer givesbetter results with average roundness of 0.84 and 0.70 for Nendran and Dwarf Cavendish, respectively.

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We would like to place on record our extreme gratitude to our guide, Prof. S. N. Hublikar, for this valuable guidance and help in completing this project and Prof. S. N. Hublikar, Head Of Department, Mechanical Engineering, we own a gratitude for giving us all the facilities required to our project. Our sincere thanks are also due to Dr. A. C. Bhagali, Director,ATS's SBGI, Miraj. We thanks to all teachers and staff of MechanicalEngineering Department, Lab and Library for extending a helping hand whenever necessary.We thank all ourfriend and others, who helped us directly or indirectly during this project work.

Thank You.

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