Development of Low Cost AC Inverter with Vegetable Battery Backup

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***Abstract*: Sine wave inverter are versatile since it is widely used nowadays when it comes to using DC power sources for both low and high power applications. This paper uses transistor and RC network inverter which is a simple in construction having low cost benefit. The novel concept of series combination of potatoes generate vegetable DC power enough to operate the inverter to obtain the AC power which is a low cost solution. The circuit was tested and found that 8.74volt DC vegetable potato power converted into AC power.**

***Keywords*: Inverter, AC power, DC power, Transistor, Potato.**

I. INTRODUCTION

Potato energy is the energy which comes from natural vegetable sources from farms and vegetable gardens. These sources are available in abundance and can be naturally replenished. Therefore, for all practical purposes, these sources can be considered to be inexhaustible. The inverter is required to convert DC into AC used in standard mode or applications. Inverters options are often available in expensive and poor quality production.
The main function of inverter is to convert DC input voltage to a AC output voltage of the desired magnitude. This paper is an approach to the DC to AC power inverter using potatoes and transistor and RC circuit. Research has been carried out on the production of cost effective AC inverter.

II. STRUCTURE OF PROPOSED WORK

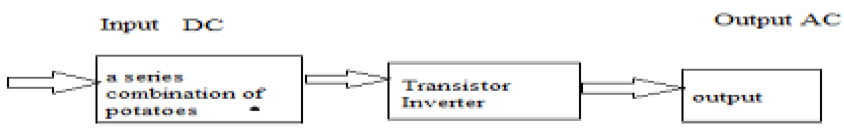

Figure 1:Block diagram of proposed system

The block diagram of the proposed circuit is shown in fig.1.It is clear from the block diagram having main three stages each of the stages and their functions are efficient ,cost effective and easy to implement and use .

A. Electrical properties of food

The charge carriers in vegetables are ions, instead of electrons. Liquid foods, conduct electricity. The concentration and mobility of ions determine the electrical conductivity Under normal applications, ions carry the charges as the mass of ions moves along the electrical field.. Under extreme electric field, electron-hopping takes place between the ions or molecules .Temperature and other ingredients in the vegetables affect the ion mobility.

B. Electrical Conductivity

Electrical conductivity is the reciprocal of resistance through a unit cross-sectional area A over a unit distance L, or the reciprocal of resistive

$$\sigma = L/(AR) \qquad (1)$$

or

$$\sigma = (I/V)(L/A) \qquad (2)$$

where, A is the area of cross section of the sample (m2), I is the current through the sample (A), L is the electrode gap or length of sample (m), R is the resistance of the sample (Ω), V is the voltage across the sample (V), and σ is the specific electrical conductivity (S/m).
The electrical conductivity of foods has been found to increase with temperature as shown in table 1.1.

Table 1.1:Electrical conductivity of food vs Temperature

Description	22degree C	60 degree C
Coffee with Milk	0.357	0.633
Coffee with suger	0.85	0.323
Apple juice	0.239	0.439
Grapes juice	0.083	0.144
Blackberry juice	0.90	0.171
Lemon	0.117	0.217
Orange juice	0.360	0,690
milk	0.527	0.883
Carrot juice	1.147	1.980
Tomato juice	1.697	3.140
Veg juice	1.556	2.828

The electrical conductivity of foods is strongly affected by ionic content, moisture mobility, and physical structure, as well as the heating process.

Researchers have reported that electrical conductivity is a linear function for temperature and presented the following model to predict the conductivity of solid foods:

$$\sigma T= \sigma p25\ [1+K\ (T-25)]$$

where σT = electrical conductivity (S/m) at any temperature T (°C), σp25 = electrical conductivity of particulate at 25°C, and K = temperature compensation constant.

Potatoes are easily available and cost at present is Rs.20/-kg,The potato has good potential to generate DC voltage .also lemon can generate DC power. Potato juice contains many water soluble chemicals that may cause a chemical reaction with one or both of the electrodes.

II. WORKING of Proposed System

The materials required For this experiment are

- A fresh potato
- Copper Electrode
- Zinc Electrode
- A Digital Multimeter to measure Voltage
- Alligator clips/ Leads

Procedure:

copper and zinc electrodes are inserted in to the potato.close to each other but not touching each other. The use of Clip leads to connect the electrodes to the Multimeter to measure voltage between two electrodes the multimeter. For this experiment The removed shell of a broken AA battery is used as Zinc electrode.lemon also resulted almost the same. In all cases the produced voltage is between 0 .299volt for lemon and 0.9volts for potato . and in all cases they do not produce enough current to turn on a small light Another observation from this experiment is that creating electricity and making a battery is easy and the main challenge is in producing a battery that can continue to produce larger amount of electricity continuously.
By connecting multiple potato batteries this can make enough electricity to light-up a super bright light emitting diode.

III.INVERTER

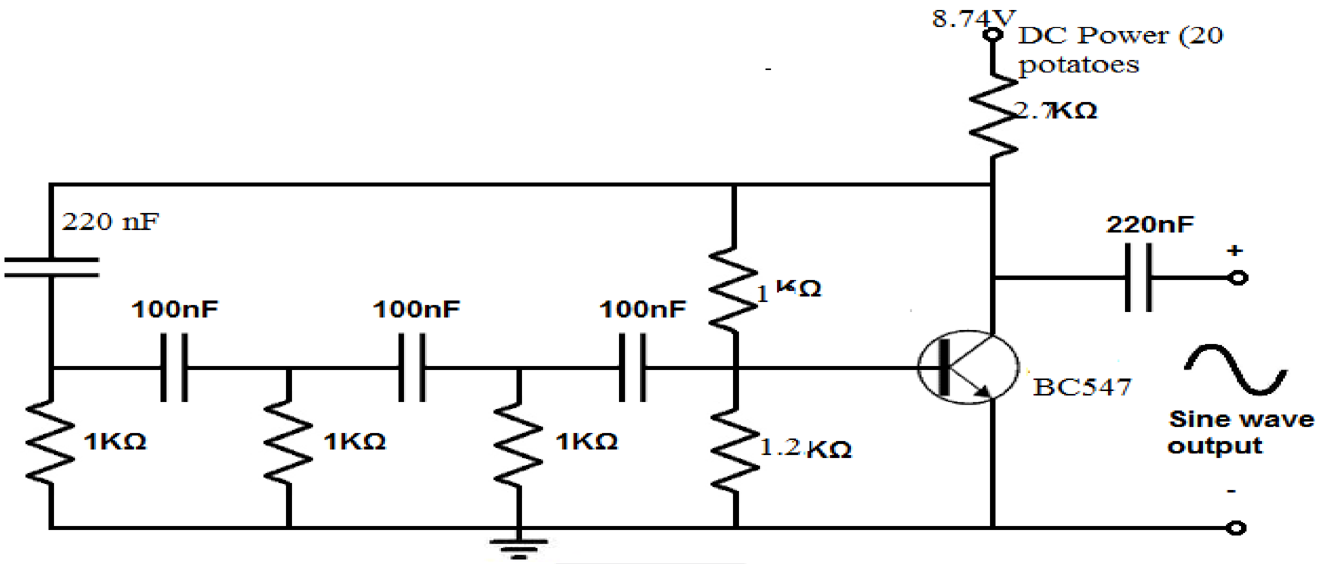

Figure 2: Transistor inverter circuit with RC Network

A simple transistor BC-547 inverter with RC network is shown in figure 2.The vegetable potato power 8.74volt DC was given across A and B ,and the output was measured between C and D.The 8.74 volts DC got converted into AC ,The transistor action with RC network which has given a faithful conversion of DC into AC.

CONCLUSION:

This was experimented practically by inserting two lemon in series and the voltage was measured across the terminal and voltage observed was o.229 volts.as shown in fig 2. The next step was to put two potato in series and the voltage observed was 0.9 volts. Therefore potatoes are put in series and generated 8.47 volts was given across the RC coupled transistor which has faithfully converted into AC supply Thus, a low cost AC inverter with vegetable potato battery backup was tested successfully.

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