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RESEARCH ARTICLE

A Review, Phyto-Electricity: Generation of Electricity From (Solanum Tuberosum)

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Abstract
Phyto-electricity is the process of generating or getting energy from green plants by using them as an electrolyte and inserting different metal plates in them to act as electrode in other to tap into the energy embedded in them and converting them to useful electric energy. Nowadays generating electricity from green plant has become very popular, but phyto-electric power generation has not been able to supply substantial energy to humans and this is due to the low electron in the plants used to generate electricity. In past research people have used trees to generate electricity. The phyto-electric power system works on same principle as the battery. In this design potato will be used as a source of power or as the green plant the battery which is filled with electrolytes, the more the electrolyte the higher the voltage that is readily available to be used, in other to be able to savor the power from the potato two dissimilar metals was used and the metals used were iron and zinc. After completing all of the paper design and analysis, the project was implemented, built, and tested to guarantee that it functioned properly. Electricity was generated and it was used to power a LED, the total resistance of the wire is 1Ω, there is also voltage loss across each node. This project was a success, but more research still needs to be done. And this project is a prove that energy are available in our surroundings, they are just needed to be investigated and further researched and there are more areas of energy and technology development that are yet to be addressed that are various problems faced by man in his day to day activities.

Keywords: Electricity; Phyto-electricity**;** Electrolytes**;** Power generation**;** Phyto**;** Plants

Introduction

A lot has been said about electricity generation in the world. Electricity generation is mainly about converting other forms of energy into electric energy. Research on electricity started in the early 1800s by Michael Faraday and his method is still used till date. Electricity generation for commercial use started in the late 1800s.

Over the years Nikola Tesla and Thomas Edison are part of the scientists that have made significant contributions in electricity generation. One of the main contributions of Nikola Tesla is the Alternating Current which is the best for distribution of electricity in households. Thomas Edison, one of America greatest inventors contributed the Direct Current which is used to power most electrical appliances in the world. An event happened in the course of history called the "The War of Currents" it was a debate between the Alternating Current and the Direct Current, argument on which is better, grew during the 1890s.

Over the years both movement of currents have been used in different areas in terms of electricity. Alternating Current is mainly used in electricity distribution in households, offices and so on while Direct Current powers most appliances. These appliances have a converter or rectifier that converts Alternating Current to Direct Current since they operate using Direct Current.

Power generation cannot be overemphasized, Electricity determines the civilization of a country, Electricity is important for the development of any country. Most of the developing countries and low-income countries in the world suffer from lack of sufficient power. Countries' economies are dependent on electricity. The world is dependent on electricity now, most of the things we do in our day-to-day life are now computerized which leads to the need of electricity. From our cars, to our home, to our schools and to our offices, everything is being run by electricity, there's always an ever growing need of more methods or ways to generate more electricity in the world.

The 2021 Texas Power Crisis, The State of Texas in the United States of America suffered a major power crisis in month of February 2021 from three winter storms, there was more than $200 billion in damages of property. The estimate of lives lost directly and indirectly as a result of the Power Crisis is between 200-700 lives. This Power crisis also resulted in food and water shortage and also heat needed during the winter. The power crisis showed the role electricity play in today is world.

Electricity also made provision for employment opportunities, In Nigeria, lack of sufficient electricity is the main problem that is slowing down the development of this country, most international investors don't want to bring their businesses in to the country because of lack of electricity and most investors know that it's bad for business.

With the role electricity plays in our day to day life in the 21st century, Research and Development on generation of

electricity should be more focused on, in other to prevent events like The 2021 Texas Power Crisis, because the main reason or purpose there is science is to make the world a better and an easy place to live for mankind, we can only do that through more research in electricity generation.

Literature Review

Phyto-Electricity (Plant Power)

This is the method of extracting energy from green plants by using them as an electrolyte and inserting various metal plates into them to act as electrodes in order to tap into the energy stored in them and convert it to usable electric energy. Nowadays, it is highly popular to create electricity from green plants, however phyto-electric power generation has not been able to provide significant energy to humans, of owing to the low electron content of the plants utilized to generate electricity. People have used trees to create power in the past, such as in the study below. This paper is talks about design and construction of a phyto-electric power system to power an electronic device. The objectives are as follows:

1. Design and construct system to generate electricity from green plants.
2. Design and construct a circuit to be powered by the energy generated from the green plant.
3. Design and construct a circuit to measure the power, current and voltage generated by the green plant.

Methodology

Principle of operation of Phyto-Electricity

The phyto-electric power system operates similarly to a battery. In this design, the potato will be used as a source of power or as a green plant the battery which is filled with electrolytes and the electrolytes have electrons in them, and the potato has electrons in it which give our body a source of nutrition, then this source of nutrient is used as an electrolyte, the higher the voltage that is readily available to be used, and in order to be able to savor the power from the potato two dissimilar metals were used. The electrons divide into two distinct poles once the iron and zinc are plunged into the potato.

1. Cathode
2. Anode

The anode is obtained from the iron plate, whereas the cathode is obtained from the zinc plate. The potato was connected in series in order to get enough power to power any appliance or equipment. To achieve a larger voltage, the potatoes will be connected in series. A small potato living checker will be created utilizing a microcontroller in order to tell if the potatoes have aged and are unable to provide adequate electricity.

The components that will be used are listed below.

1. PIC16F88.
2. 9v battery.
3. LCD (Liquid Crystal Display).
4. Potato.
5. Iron nail.
6. Zinc (nail).

PIC16F88 - The pic16f88 is an 8-bit microcontroller with 18 pins (Figure 3.1a) that operates on TTL (Transistor Transistor Logic), which means it can operate between 5 and 5.5 volts and is programmable. The Microcontroller is a complete computer on a single chip that can accept, process, and output data, as well as having a ROM and RAM. In PIC16F88 devices, there are two memory blocks. The program memory and data memory are the two types of memory available. Because each block has its own bus, access to all of them can happen at the same time on the oscillator. General-purpose RAM and Special Function Registers are two types of data memory (SFRs). The SFRs that regulate the "core" are explained in this section. The SFRs that control the peripheral modules are discussed in the section that discusses each peripheral module individually. There is also data EEPROM memory in the data memory region. In other words, an indirect address pointer indicates the read/write address of the data EEPROM memory.

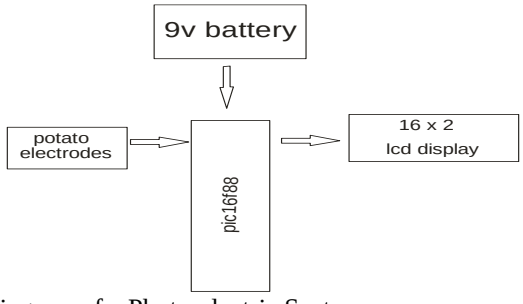
9V BATTERY - The 9 volt battery was used to power the microcontroller in other to tell the power level remaining on the potato.

LCD (Liquid Crystal Display) - The LCD was used to display all the parameters to be displayed to the user 23 and the LCD used was a character LCD 16x2

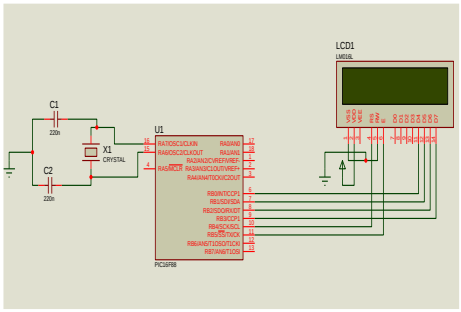
POTATO - The potato acts as an electrolyte, supplying energy. Potatoes were chosen because they are the world's fourth most prolific food crop and are grown all across the planet, including the tropics and subtropics. But, in addition to being high in phosphoric acid, potatoes are great because they are made up of durable starch tissue. Additionally, boiling the potato reduces the resistance in the dense flesh, allowing electrons to flow more freely, resulting in a considerable increase in overall electrical output.

IRON NAIL - The iron nail serves as the positive electrode used to savor power from the potato.

ZINC (NAIL) - The zinc (nail) was used as the negative electrode to savor power from the potato



Block Diagram of a Phyto-electric System

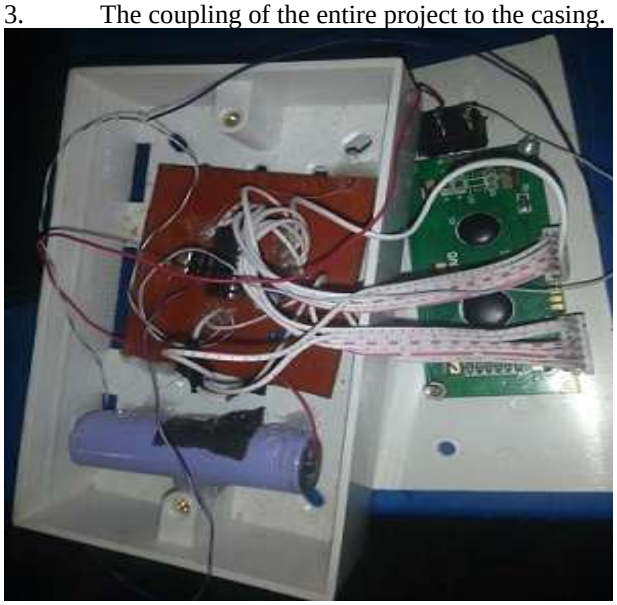


Circuit Diagram of the Phyto-electric System

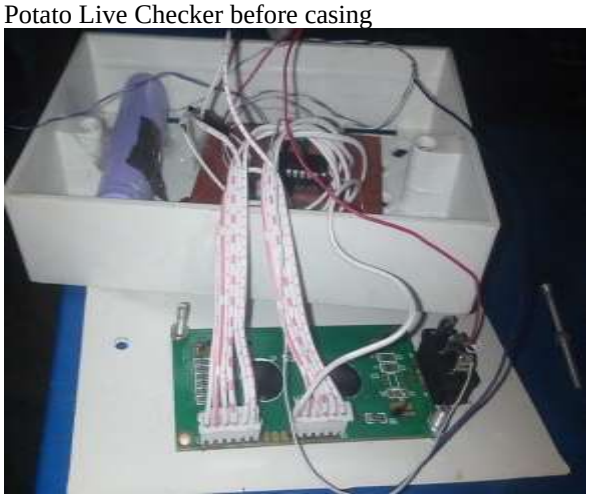
Construction

After carrying out all the paper design and analysis, the project was implemented, constructed and tested to ensure its working ability. The construction of this project was done in three different stages.

1. The implementation of the whole project on a solder-less experiment board.
2. The soldering of the circuits on printed circuit boards.
3. The coupling of the entire project to the casing.



Potato Live Checker before casing



Potato Live Checker before casing and boxing

Potato Live Checker and the circuit boxed and cased

Testing

The potatoes were plugged into the electrodes and the output power was first measured and corrected to 5v using voltage regulator after which it was used to power appliances (LED). **Oscilloscope**: To examine the rippling in the power supply waveforms and check that all waveforms were proper and their frequencies were accurate, an oscilloscope was utilized. To verify correct oscillation at 8MHz, the waveform of the oscillation of the crystal oscillator utilized was monitored.

Digital Multi-meter: Voltage, resistance, continuity, current, frequency, temperature, and transistor are all measured by a digital multi-meter. The process of putting the design on the board necessitated the measurement o f components' voltage, continuity, current, and resistance values, as well as frequency measurements in some situations. The output of the voltage regulators used in this project was checked using a digital multi-meter.

Results and discussion

After stacking the potatoes together power was available and also after using a boost converter board on the stacked potatoes we were able to light up an LED.

28 potatoes were used in total. And all 28 potatoes were connected in series to double the voltage and compensate for the voltage loss across each node.
7 potatoes par track.
2 track per phase.
28 potato stack in total...
Each line gives 0.3V minimum.
Total voltage = 28x0.3 = 8.4V.
When the led turns on the voltage drops to between 2V and 3V.
Total resistance of the wire =1Ω.

Total current in the circuit before load is placed on the circuit:
The total current of the whole circuit could not be measured3. because it is very low possibly in milli or micro ampere that is why we mainly concentrated in boosting the voltage of the circuit.

Conclusion

This project which is the generation of power from green plants was a success although still needs more research, this designed proved the fact that energy is readily available in our surrounding and only needs to be investigated into in other to be able to get more power or generate more power.
Stable power has always been a problem, particularly in African countries, particularly Nigeria. Scientists have attempted in the past to generate electricity from various power sources, one of which is phyto-electric power system design, but the design has not been capable of delivering sufficient power to humans. Living plants convert solar energy into organic compounds, of which 40% or more can be released into the soil, according to the concept of renewable energy production. Electrochemically active microorganisms that employ the anode of a fuel cell as an electron acceptor can oxidize the released organic molecules. At the cathode, the electrons are converted to water by oxygen. Without harvesting the plant, day and night electricity may be produced sustainably from biomass. This allows for the production of economical electricity anywhere that plants can grow. This is not really a European problem. It also provides prospects for poor countries and isolated areas. This challenge inspired the creation of this project design, and with it, we hope to create a prototype that can be enhanced in the future to generate power from green plants t o power electrical devices. As new generations of technology become available, it is necessary to review what is and is not possible in terms of a source of energy and power generation.
For most applications, tree power is unlikely to replace solar power, but it could give a lowcost option for powering tree sensors that detect environmental conditions or forest fires. Instead of cutting down trees to make room for solar infrastructure or connecting wires from towns across the forest to monitor tree health, environmental conditions, o r forest fires, the electronic output might be utilized to measure a tree's health. It can be utilized as a power source in distant places without access to electrical grids, such as most of the world's cities. This study could open the path for further novel and unconventional energy sources.
For the purpose of the future research, the project work can be improved upon. The following areas were highlighted for this purpose.

1. The whole circuitry can be improved on to generate more power.
2. Moreover, it is recommended that students should be enlightened on new areas of technology that are yet to be addressed in order to bring solution to the various problems faced by man in his day to day activities.

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