IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 8, Issue 4, April 2020

Power Generation Using Atmospheric Electricity

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Abstract: The atmospheric region is composed of charged ions which is used as a major power generating component. These charged ions are always in an unbalanced condition and they cannot be used directly as a power source. By collecting these charged ions using a conducting medium such as copper and with respect to the earth ground, the electricity can be produce and store it in a series of capacitors. By the continuous charging and discharging of the capacitor the atmospheric ions can be used as power generating source. The voltage stored inside the capacitor is static hence it is high voltage DC. The dc voltage is converted into a frequent pulse by providing spark gap. By using step down transformer, the high voltage is reduced, and it can be supplied to the load.

Keywords: Static voltage, step down transformer, spark gap, super capacitor

I. INTRODUCTION

The concept of atmospheric electricity was proposed by Benjamin Franklin in the year 1752. He said that the atmosphere consists of enormous number of charged ions. Normally atmospheric ions are produced by galactic cosmic rays which is due to corona effect that occurs in the outer space continuously, during that time ionization occurs. These charged ions can be used as useful power source by the process known as ionization by interacting the conductor with the charged ions. More amount of voltage can be generated by this method of ion harvesting and it is totally different from energy harvesting from the lightning bolt. The power generation from the lightning is not safe and it is highly impossible to collect and store it. Our method of ion collection needs a conducting medium such as a copper string that connected to the kite and is flown at a constant altitude.

The ions from the atmosphere are positively charged which travel towards the ground which is negatively charged through the copper string. A static electricity is produced which is very high voltage with very low current. This static electricity cannot be utilized directly, but it can be stored in capacitors.

Series capacitors are provided which is the high voltage capacitor bank. When the stored energy is discharged it comes in the form of DC voltage. A spark gap is provided to convert the DC voltage into pulses which can be fed to the step down transformer. Approximately 1.5 to 2 kilo volts can be collected through ion collector such as copper string. The ions collected from atmosphere will be varied with the change in climatic conditions. In winter more voltage can be obtained when compared to the summer. The output from the transformer is fed into the bridge rectifier to rectify an alternating current into a direct current. The output from the bridge rectifier is given to the capacitor, where the capacitor filters the noise and it is given to the respective load.

II. EXISTING SYSTEM

Firstly, the ion collection from the atmosphere will be processed by the flying drone technology where additional mechanical work will also be implemented in it. Another method used is by placing long copper rods on the ground. These rods collect the ions and store them in generators. This method isn't cost effective as the copper gets corroded fast. Ion harvesting technology is a process of using many poles to harvest the electric charge of the ions in the atmosphere as a source of supplementary source of clean energy. Experiments have been made where either a drone or a long copper rod is placed on the earth's surface. The ions are attracted towards the earth. The ions from the atmosphere are collected by the copper conductor. These ions travel through the rod and the ions are collected in a storage generator where the power is stepped down to increase the current level. These can be used for charging batteries, or powering motors, lights etc. The problem with the existing method is that it has a higher implementation and maintenance cost. It requires a high post to collect the atmospheric ion.

III. PROPOSED SYSTEM

In this project the main aim is to produce a large amount of power from the ions in the atmosphere. This is chosen to generate clean electricity through ion harvesting.

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What is Ion Harvesting Technology?
It is the process of generating power using the charged ions that are naturally present in the atmosphere. This offers a way to produce a supplementary form of clean energy. This is a very cost-effective method to generate high voltage anywhere on earth anytime during the day or night.

In this project a kite is flown in the sky at a constant altitude. This kite is attached to a copper wire of gauge 32 SWG. This is left into the sky to collect the free ions that are present at a high altitude. The ions are collected and sent towards the earth. These ions are stored in a series of capacitors that are known as the high voltage capacitor banks.
These ions are collected and stored in a series of capacitors.

IV. HARDWARE INTERFACE

A. 32 GAUGE COPPER WIRE

Copper wire is used to fly the kite to reach its required altitude. The thickness of the copper will determine the amount of ion extraction and power generation capacity. Copper with graphite coating will also improve the ion extraction from the atmosphere. It also make sure the altitude of kite hence copper is the good conductivity medium.

B. CAPACITOR

Capacitor is used for the storage of ion in the form of charges. The range of the capacitor is 2kv, 2200uf. The capacitor are arranged in series to store the ion collected from the atmosphere in form of charge. The charges in the capacitor will be Dc as a static voltage. Hence the static voltage cannot be used directly by dicharging the capacitor frequently for particular interval of time will make the static voltage as an useful power generating source.

C. STEP DOWN TRANSFORMER

The step down transformer is used to convert high primary voltage into a low secondary voltage. The voltage reduction capability of step down transformers depends on the turn ratio of the primary and secondary coil. As the number of windings in secondary coil is less as compared to the number of windings in primary coil, so the amount of flux linkage to the secondary coil of the transformer will also be less compared to the primary coil. The input of transformer is Ac here the charge stored in the capacitor is either Dc or in the form of static voltage so it cannot be given as an input to the transformer. By providing a spark gap between the transformer and the series of capacitor, the discharging of voltage from the capacitor will passes through the capacitor and pulse will be given as an input. Hence the step down transformer will convert 2kv into 30volt.

Transformer design:
- Primary Voltage V1=2kv
- Primary coil gauge = 32 SWG
- Secondary Voltage V2=30v
- Secondary coil gauge = 17 SWG
- Primary Current I1=3mA
- Transformer Ratio K=V2/V1=0.015
- I1/I2=K
- Secondary Current I2=I1/K
  I2=3mA/0.015
  I2=200mA

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D. ***BRIDGE RECTIFIER***

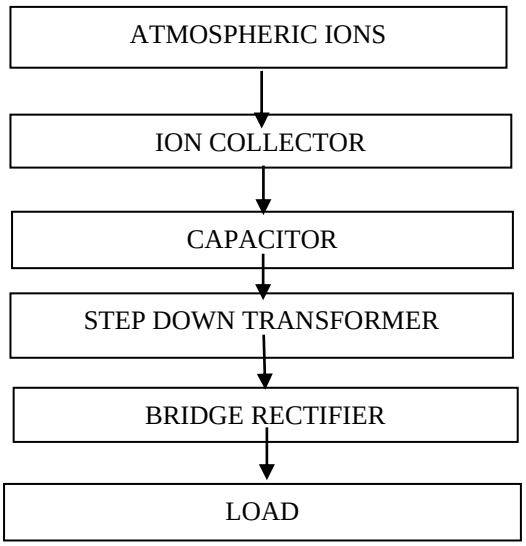
W10 diode is used in this bridge rectifier used to convert Ac to Dc voltage. The output from the step down transformer is Ac hence it cannot be directly given to the load or any supply. For the conversion of the voltage from the transformer bridge rectifier is used.

V. WORKING

The atmosphere is filled with unbalanced charged ions due to the galactic cosmic rays which is caused by the corona effect. These ions are positive in charge are the earth is usually filled with negative charges. A kite is flown on the atmosphere at a constant altitude. Here instead of thread, a long copper string of 32 SWG is used. The lower end of this wire is attached to the capacitor and the other end of the capacitor is given to the ground. This is used to collect all the positive ions that are left free in the atmosphere. Since the earth is negatively charged the charges are attracted towards it and all the charges begin to travel downwards.

Two capacitors are connected in series. This capacitor pair are known as the high voltage capacitor bank. From the atmospheric ions a static electricity is produced which is very high voltage with very low current. This static electricity cannot be utilized directly, but it can be stored in capacitors. The capacitor then discharges all the charged electrons in the form of DC. A connection is given parallel to the capacitors. One end of this goes directly to the step-down transformer and the other is connected to the spark gap. A spark gap is an arrangement of two conducting electrodes that is separated by a gap which is usually filled with a gas such as air, it is designed to allow an electric spark to pass between the conductors. Now the charges that are stored in the capacitor are in the form of high voltage DC. This cannot be directly given to the transformer. Hence using the spark gap the charges are given as pulses. The charges hit the spark gap and form periodic pulsus which can be given as an input to the transformer. The voltage that can be collected from this is about approximately 1 to 2kv volts. But the current is very low. Since we require high amount of current, we use a step-down transformer. This transformer reduces the voltage and the current is increased. Now the charge that is produced is either stored in batteries for future use or it can be connected directly to the load.

VI. FLOW CHART:



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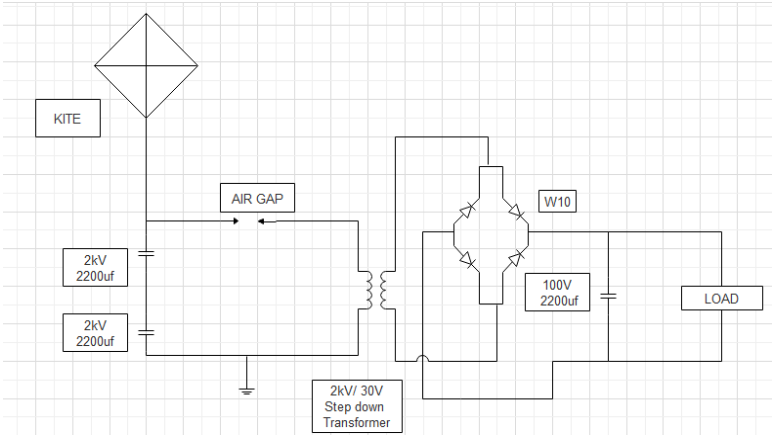
VII. ALGORITHM

1. Start.
2. The principle of the project is to collect the free ions from the atmosphere and use them as an energy source.
3. The ions are collected using an ion collector in the form of a kite which collects the free ions and bring them towards the earth.
4. The ions charge are stored in a series of two capacitors known as the high voltage capacitor bank and are discharged for further proceedings.
5. The charge is then passed through a spark gap and sent through a stepdown transformer.
6. The received energy is utilized by giving to the load.
7. Stop.

VIII. CIRCUIT DIAGRAM



IX. RESULT

At the altitude of about 130 feet approximately we can yield 1.2 to 2 Kilovolt
It may vary according to the altitude of the kite and climatic condition
It also vary depend on air pollution in the atmosphere.
At summer about 60-100 volts per meter can be produced whereas at winter it raises up to 300-500 volts per meter.

ACKNOWLEDGMENT

We would like to express our profound gratitude to **Dr.S.Anbumalar** (Head of the Department, Electrical and Electronics Engineering, Sri Manakula Vinayagar Engineering College, Puducherry, India) and project guide **Mr.A.Janagiraman** (Asst. Prof, Electrical and Electronics Engineering, Sri Manakula Vinayagar Engineering College, Puducherry, India) for the year for their constant support and encouragement and all the other faculty members who guided us and supported us to complete this project.

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