



OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

AIR PURIFICATION BY USING SOLAR POWER RESOLVING AIR POLLUTION PROBLEM

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Abstract: Recently, the problem of air pollution is emerging due to increasing demand of fossil fuel, vehicle and factory. Especially, one of the biggest problems is increase of a fine dust. Since fine dust is very fine particles of 10µm or less and it is difficult to remove, because it cannot be seen with naked eye. To sort out this problem air purifier technology receives attention because of the Fine dust problem. The air cleaning systems are widely used at Indoor. However, the problem of air pollution is generated at Highway and factory. Therefore, it is necessary to study the air Purification system to be applied to factories and highways. This paper describes design and hardware implementation of air purifier for fine dust system. Solar power source and batteries are utilized to develop a prototype.

Keywords: air purifier, solar power, particles, batteries

I INTRODUCTION

One of the biggest challenges that the world faces today is providing clean and sustainable energy to future generations. Recently, with the development of industry, the use of fossil Fuels and the demand for personal vehicles are increasing hence, the quantities of fine dust are also increasing. Most of the fine dust is composed of Sulfate and Nitrate, which cause smog and have adverse effects on human Health. In particular, the fine dust is difficult to remove because it can be checked by naked eyes and cannot be easily removed. The fine dust is a very small particle of 10 m or less, which is difficult to be visually recognized. So it can't be completely removed without help of the fine dust removal system.

II CHALLENGES WITH AIR POLLUTANTS

Even on a clear day without smog, these fine particles can Enter the respiratory tract when their concentration is high. If

This occurs, it can be discharged through the respiratory tract Depending on its size, but will adversely affect the lungs, blood Vessels, and stomach

II PERTINENT ENVIRONMENTAL ISSUES

Many of the pertinent environmental issues today, such as Local and regional air pollution, acid precipitation (also called Acid rain), and global climate change (or global warming as it Gets called by the media), can be traced primarily to emissions From the use of fossil fuels for different energy and transportation sectors. Air quality is most strongly affected by some of The short-lived species like carbon monoxide (CO), different Oxides of nitrogen (NO+NO2=NOx), sulfur dioxide (SO2), Ozone (O3), volatile organic compounds (VOCs), and various Atmospheric particles (also called aerosols). The particles of Most concern are those that can lodge deeply into the lungs; These are primarily the particles of less than 2.5 µm in diameter (called

PM2.5) that are primarily produced from gases like SO₂, but also includes black carbon (soot) and other very fine particles. Some of the pollutants like NO_x and VOCs are especially important for forming ozone, a key component of Urban smog, whereas SO₂, NO_x and other gases can produce particles that also lead to environmental concerns from acid rain. A variety of gases and particles, especially the long-lived gases like carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and various chlorofluorocarbons (CFCs) and other halocarbons, are of special concern to the changes occurring in the Earth's climate system. The CFCs and other halocarbons have also been the primary sources of observed decreases in stratospheric ozone that are now in the process of being controlled through the international Montreal Protocol To Protect the Stratospheric Ozone Layer. As we know that air pollution level in cities is very high. Most of pollution comes as by-product from vehicle and construction of buildings, these are in form of particulate matter which are like Methane, carbon dioxide, dust particulate etc. These create a lot of health problems like respiratory illness, decreased lung functions, development of diseases like asthma etc. Many institutes are also not able to afford these because of high cost and installation cost. Government organizations have very low budget for air purifier like extra expenditure. So, it is advisable to develop such air purifier which can cost less and are highly efficient. So, we are making solar powered air purifier, which runs on solar energy without use of filters and also works for longer duration than others. It uses component like solar panel, charge controller, microcontroller, high voltage electrode and MQ2 gas sensor.

IV PRINCIPLE OF CORONA DISCHARGE

Corona discharge is an electrical discharge caused by the ionization of a fluid such as air surrounding the charged conductor. Spontaneous corona discharges occur naturally in the proper high-voltage systems. Corona discharge will occur when the electric field around a conductor is high enough to form a conductive region. But not high enough to cause electrical breakdown or arcing to nearby objects. Refer to Figure 2, it is often seen as a bluish glow in the air adjacent to pointed metal conductors carrying high voltages and emits light by the same property as a gas discharge lamp [2-4].

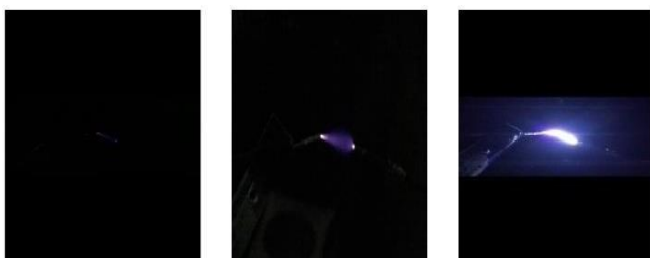


Fig. 2. Corona Discharger

The electrostatic precipitator is a dust collecting device that removes fine dust by attracting various dust particles contained in the air just like Figure 3. Corona discharge occurs when a high voltage is applied between the (+) and (-) poles. The moment this occurs, charged ions are generated. (-) charged ions combine with the dust particles in the incoming air (-) making the dust migrate to the (+) pole attached to the electrostatic precipitator. This principle makes it easy to remove various kinds of fine dust particles.

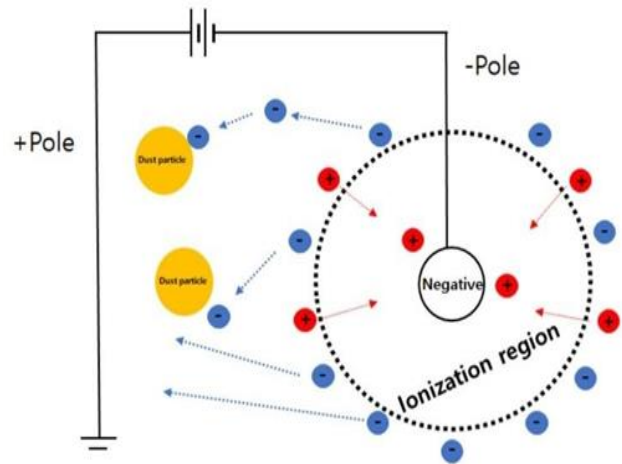
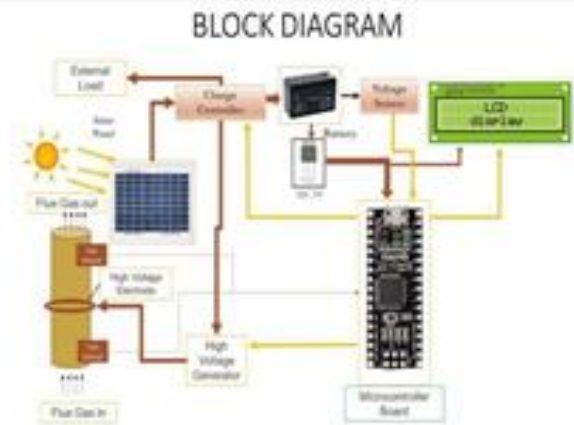


Fig. 3. The method to get rid of fine dust

Solar energy is one of the green power sources. Therefore, solar energy demand increases. Our systems are easy to use with solar power systems.



V WORKING

The components of the project consist of a solar panel which converts solar energy into electrical energy. This electrical energy is passed to the charge controller and charged the battery. When solar energy can completely satisfy the load and battery is also fully charged then charge controller provides charge directly to the high voltage generator that is Marx generator. Marx generator works on low voltage supply to generate high voltage pulse. When solar energy is not available then battery provides voltage to Marx generator to generate high voltage at electrode. There are two gas sensors

in the circuit at both ends of high voltage Electrodes. Initial gas sensor senses which pollutants are present in the air and shows that on LCD display. When gas is passed through the electrodes ionization takes place and Pollutants are absorbed in the electrode. Filtered gas is again sensed by another gas sensor and again pollutants if any present are displayed on the LCD display.

POLLUTED SUBSTANCES

- LPG gas.
- Alcohol.
- Hydrogen.
- Propene.
- Methane.
- Combustible stem.

CALCULATION

Solar panel power = 20 watts Solar panel voltage = 12V
Hence,

Load current = power/voltage = 20/12 = 1.67A

Battery charging time = Battery current hour/ load current

= 7.5/1.67

= 4.49 Hrs

VI CONCLUSION

Now we have seen that how efficient is air purification by solar power than other type of device available in market. It also very economical and do not have to replace any component quickly. It reduces particulate level to satisfactory position where a person does not need to worry about pollution related problems. A pure and clean air is right of a human being and all Other living creatures on this earth and this project is a small Effort from our side to give the all their right. Also, in future, modifications can be made to improve Working efficiency without effecting setup.

VII FUTURESCOPE

Till now we have completed construction of charge Controller, microcontroller. We are having other Components like solar panel, gas sensor. Some Components like high voltage generator that is Marx Generator and high voltage electrode are due till date. Those components will be available soon. Then we'll be working on electrode's ionization process and absorption of pollutants on high voltage electrodes.

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e- National Conference

On

Advances in Modern Technologies of Multidisciplinary Research in Engineering Field (AIMTMREF)

[20th -21st May, 2021]

In association with ISTE , IETE and CSI

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