

Solar Powered Air Cleaner Streetlamp



Skopje / North Macedonia

Question

Air pollution is one of the biggest factors threatening our world. Can pollution that affects the human, plants and animals be cleaned with an eco-friendly, renewable, economic, applicable energy source?

Hypothesis

If the thousands of street lights that are already found in the cities, cleaned the air while supplying light only by using solar energy, it would help a lot.



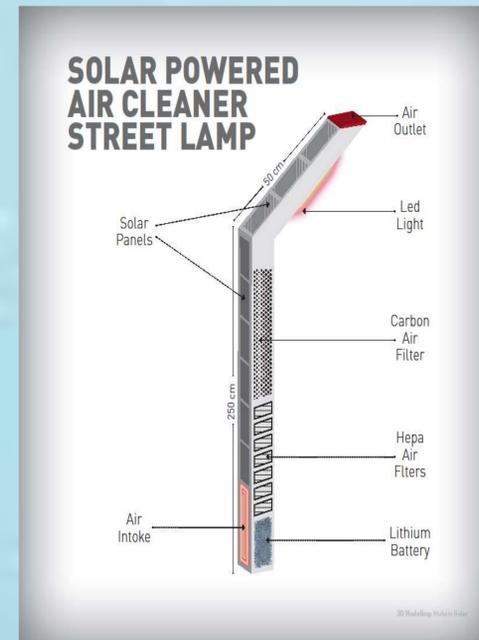
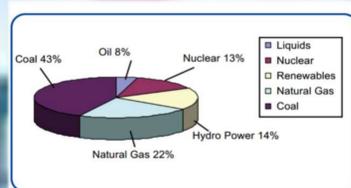
Aim:

The purpose of this project was using sun light as natural, continuous, renewable, green and free energy source to light and clean the streets air. We hoped that using sun light as economical and ecological source could help to improve air quality of our polluted cities.

Introduction

Environmental pollution is currently the biggest challenge facing the world today. Overpopulation has been observed in the recent century and its connection to all other problems cannot be ignored. Global warming, climate change and deforestation are all consequences of pollution and waste disposal, as the world population increases.

The burning of fossil fuels for transportation and electricity produces both primary and secondary pollutant factors of air pollution. Waste products from the fossil fuels heat the atmosphere and pollute the air. The global demand for energy will increase rapidly due to the continuous growth of global population. There are both economic and environmental reasons for developing alternative energy technologies.

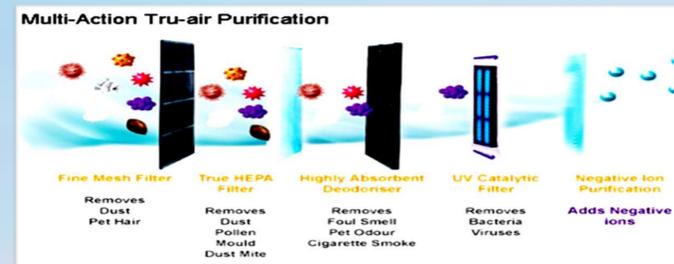


What is an air purifier?

An air purifier or air cleaner is a device which removes contaminants from the air in a room to improve indoor air quality. Air purifiers may also be used in industry to remove impurities from air before processing.

How do air purifiers work?

Air purifiers use a system of internal fans to pull the air in your home through a series of filters that remove harmful airborne particles like dust, pollen and bacteria.



Materials

Solar Panels, Street lamp, Air purifier filters, Carbon filters and HEPA filter, Air quality tester AEOROCAT 831 made by Met One Instruments, Inc – US. 2 fans, Battery and Cables.



Experimental procedures

1. First we designed a street lamp
2. We assembled the HEPA filter inside the body and then we added the Carbon filter
3. We put the fans on both sides of the street lamp (one for air intake, and one for air outtake)
4. We arranged the sizes of the panels according to the lamp, and then we put them on it.
5. After we were done with the prototype of the lamp we borrowed a professional machine for measuring the PM particles in the air
6. We measured the PM particles in the air for 8 hours in a closed room. At first we didn't turn on the lamp, but after a while we turned it on and saw an enormous decrease in the PM particles
7. We sent the machine back to the lab and waited for the results.

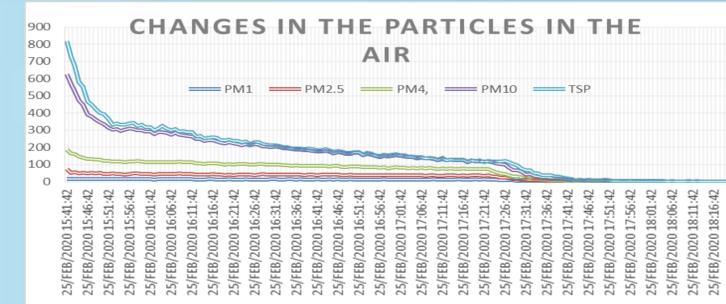


General system design

Solar street light mainly consists of solar cell module, module bracket, electrical cabinet and other parts. The system is normally set to run 8 hours a day, 5 consecutive rainy days each month and 20 consecutive rainy days every two days. The system design process mainly includes: lamp post selection, lamp selection, solar module configuration, battery, controller configuration.

Results, analysis and discussion

For checking the experiment we used the AEOROCAT 831 made by Met One Instruments, Inc – US. We checked the air quality in the air before and after using the filter. We checked for PM1, PM2.5, PM4, PM10 and TSP particles with an aerodynamic diameter smaller than respectively 10, 2.5, 1 and 0.1 μm. TSP refers to total suspended particulates. The decrease in these particles in the air decreased massively.



Conclusion

Despite all the advantages fossil fuels have provided for our society, it has also had negative effects on the environment such as air pollution due to acid rain emissions, water and soil pollution and carbon dioxide accumulation in the atmosphere.

From the analysis and repeated measurements performed, it can be concluded that the HEPA filter significantly affects the improvement of the air quality for all pollutants. Street lights that are already in use can be used for air cleaning to assist population health quality.

Ideas for future research

Our innovative unique design can be applied to other public instruments as further implements. For example we can use our idea for the bus stop, billboard, balcony etc.

Prepared By: **Betul Gul Erdil & Cedo Trpeski**

Mentor: **Ismail ERDIL**