

“Air Water Purifier”

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Abstract: Infectious diseases caused by airborne bacteria and viruses are a major problem for both social and economic reasons. The significance of this phenomenon is particularly noticeable during the time of the coronavirus pandemic. One of the consequences is the increased interest in the air purifier (AP) market, which resulted in a significant increase in sales of these devices.

In this study, we tested the efficiency of APs in removing bacterial air contamination in the educational context in the Upper Silesia region of Poland during the “cold season” of 2018/2019. During the 6 months of measuring microbiological air quality, an 18% decrease in the concentration of microbiological pollutants as a result of the action of the APs was recorded. Additionally, the results of the particle size distribution of the bacterial aerosols showed a reduction in the share of the respirable fraction (particles with an aerodynamic diameter below 3.3 μm) by an average of 20%.

Keywords: coronavirus, microbiological air quality

I. INTRODUCTION

People spend about 80–95% of their lives in indoor spaces and breathe in around 10 m³ of air every day (Lee and Chang, 1986; Dacarro et al., 2003; Tringe et al., 2008). Moreover, “people inhale 6–10 L of air per minute, which amounts to 15,000 L/day” (Wood et al., 2002). According to measurements conducted in the last 20 years by the US Environmental Protection Agency, the air in indoor spaces is sometimes ~100 times more polluted than atmospheric air and indoor air pollution is one of the top five health hazards (Kotzias, 2005; Gawrońska and Bakera, 2015). The increased susceptibility of children to air pollution is associated with their much more varied activity during the day, the fact that they inhale a greater volume of air in

relation to their body size and the incomplete maturity of their immune systems (Branco et al., 2014; WHO, 2018). Air quality in indoor environments, such as nurseries, where children stay for up to 40 h per week, is particularly important because children are a key vulnerable group and may be exposed to lung damage and infections associated with poor indoor air quality (IAQ) (Bragoszewska et al., 2018a; Oliveira et al., 2019; Chegini et al., 2020).

The basic indicator of indoor air pollution is the concentration of bioaerosols (Jiayu et al., 2019). When it comes to negative health effects, bioaerosols play an important role as risk factors. Biological aerosols are pollutant particles that include microorganisms such as bacteria, fungal spores, viruses, or pollen grains and are always present in the air (Adhikari et al., 2006; Bragoszewska and Pastuszka, 2018; Tolabi et al., 2019).

• Problems Identification

Due to globalization and industrialization ecological life cycle has been affected which leads to increase in air pollution. The World Health Organization defines air pollution as “the presence of materials in the air in such concentration which are harmful to man and environment.” A lucrative attention turned towards air purifiers for healthy indoor environment and human health against diseases. Air filtration is commonly suggested as a component of environmental control measures for patients with allergic respiratory disease.

• Diseases Caused By Indoor Air Pollution

Over 3.8 million people a year die prematurely from illness owed to the household air pollution induced by the inefficient use of solid fuels and kerosene for cooking. Among these 3.8 million deaths:

- 27% are due to pneumonia
- 18% from stroke
- 27% from ischemic heart disease

- 20% from chronic obstructive pulmonary disease (COPD)
- 8% from lung cancer

II. LITERATURE SURVEY

1) Sirichai watanasophon and sarinee onitrakul, "Garbage collection robot on the beach using wireless communication", international conference on informatics, environment, energy & application IPCBEE, DOI IO 7763/CBEE 2014 V66.19

This article presents garbage collection robot on the beach using wireless communication. The robot is built on the caterpillar wheels, sizes 52x74x17cm and the power is supplied from 12v 30Ah battery which is connected to 40w solar cells. The user can control a robot via a program developed from visual basic 2005 application based on window xp. The command from user is sent via Bluetooth to PIC18F4550 for processing. In addition it is also equipped with an IP camera with added pan/tilt capabilities which relay feedback information to the human operator via Ad-hoc system. The result of robot performances were found that the robot can move with an average speed 0.5meters per second on the sand via wireless communication and collect the garbage with side 12.5 x 49cm for example: glass bottles and plastic, etc

2) A Delprezo *et al* proposed the Sizing criteria of on-board sources and energy storage systems for a hybrid electric boat. Two different design criteria are proposed. A criterion to ensure the engine-generator group runs at fixed speed and power and the other to run the engine at variable power and speed. Series hybrid for providing the average power required by the load is considered. But it is not suitable for studying the electrical and electromechanical phenomena related to motor behaviour. The fuel prices, the increasing restrictions of CO₂ and nitric oxides NO_x emission due to new ecological policies, and generally the need for more eco-friendly transportation were the reasons that forced the marine companies to re-examine the systematic use of PV systems on large vessels. Without changing the weight and dimensions of the diesel powered boat is converted to solar powered.

3) G Schirripa Spagnalo *et al.* A ferry boat powered by Lithium-Iron batteries that can be charged at any harbor visit. In addition the energy for navigation is derived from a photovoltaic plant. The Power Management System (PMS) for managing the energy resources to navigate safely in the event of failure of one or more devices is also proposed. Better performances can be achieved with highly efficient solar panels and rechargeable batteries with light weight and high capacity. Global aspects of a boat propulsion system investigated using a low scale system was developed by Tiago.

4) Freire *et al.* which is modeled and analyzed using two different battery types (lead acid and Ni-MH) and a power converter. Using classical approaches (DC motor model), the proposed solution is analyzed by implementing a speed control system with a sliding mode controller. A ripple rejection model was implemented to reduce substantially the capacitance needed at the converter output. These solutions could reduce also the cost and dimensions of the all propulsion system. The controller for both converters can be built only with digital components, capable also of PWM control at constant frequency, with current-mode control done cycle by cycle. Design and analysis for the solar-powered boat development where a diesel powered boat converted into solar powered is discussed by Leung.

5) C P *et al.* For starting from standstill, super capacitors are used for supplement to the high startup current. Carbon dioxide emission can be dropped by 74.2% and the percentage of the cost saving is more than 87%. Better performances can be achieved with high efficient solar panels and rechargeable batteries with light weight and high capacity.

III. PROPOSED METHODOLOGY

• Components

The parts of modified air filter are:

1. Main frame
2. Battery's
3. DC brushless blower
4. Dc fan
5. Cables and Connectors

• Working Principle

Initially we supply current to the system (230v, 10 Amps). Adaptor converts the AC current to DC current and supplies it to the air blower pumps. Air blower pumps convert the electrical energy into mechanical energy and the fans start rotating. Due to rotation of fans it sucks the air from atmosphere. And that air is transported to pipes by air blower pumps. The pipes transport the air to the water tank. At the end of pipes nozzles are fitted which are used to increase the velocity of the air. And the air enters into water. Water eliminates the impurities like dust, fungus etc from the air. Due to water the humidity percentage of the air gets increased. This purified and humidified air comes out from the system.

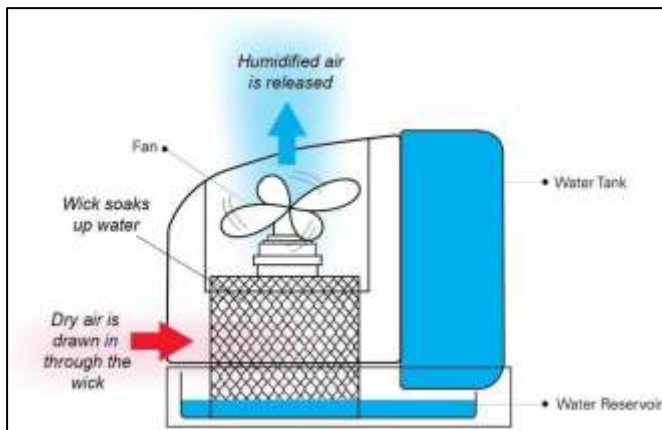


Figure 1. Air Water Purifier

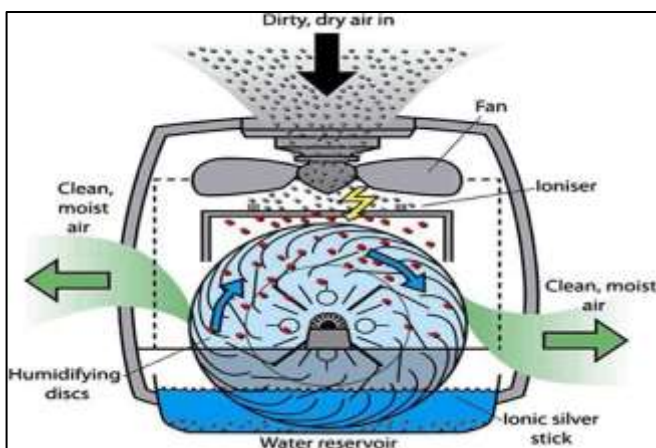


Figure 2. Working of Purifier

Advantages

1) Air purifiers remove triggers for asthma attacks

Air purifier are capable of eliminating microscopic level impurities. Asthmatic trigger factors like dirt, dust, carbon monoxide, air freshening sprays, hairsprays, smoke from cooking, paints, cosmetics, mold spores, new carpets are effectively removed by air purifier and protect us from disease like asthma.

2) Air purifiers trap tobacco and cigarette smoke, preventing lung disease

Encasing smoke with air purifiers with HEPA filters and activated carbon are gaining more popular nowadays since inhaling of tobacco smoke cause chronic obstructive pulmonary diseases and heart diseases. Breathing in tobacco smoke can result in the development of chronic obstructive pulmonary diseases as well as heart disease. Elderly people are at a higher risk of dementia due to exposure of secondhand smoke. HEPA filters can remove tobacco smoke 0.3μ and cigarette smoke from $4-0.1 \mu$.

3) Natural and Chemical-Free Air Purification

Water air purifiers clean the air using just water, without relying on synthetic filters, chemicals, or ionizers. This makes them an excellent choice for:

- People sensitive to chemicals.
- Homes with pets, children, or allergy sufferers.

The process involves drawing air through a swirling water basin, where dust, pollen, and impurities are trapped and removed from circulation.

IV. CONCLUSION:

The outcome of this project is a next generation air purifier with a new filter innovation. The new filter makes it possible to have a smaller housing compared with competitors but still having high performance. This means that it does not take up as much space and is easier for the user to move around from place to place inside the apartment; it is also equipped with a handle. The 360o Air is also easier to fit in more places in a home because its design does not restrict its position as much as competitors. That is, it has been given a round shape and have therefore no defined backside that needs to be placed towards a wall. The uniform round shape allows more varieties of how it can be positioned in a home. The filter is cleanable and does not need to be changed. The filter also has a low pressure drop which results in less generated noise and lower energy consumption.

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