



# **iJRASET**

International Journal For Research in  
Applied Science and Engineering Technology



---

# **INTERNATIONAL JOURNAL FOR RESEARCH**

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

---

**Volume: 7      Issue: V      Month of publication: May 2019**

**DOI: <https://doi.org/10.22214/ijraset.2019.5246>**

**[www.ijraset.com](http://www.ijraset.com)**

**Call: ☎ 08813907089**

**E-mail ID: [ijraset@gmail.com](mailto:ijraset@gmail.com)**

# Aqua Air Purifier

Harshit Srivastava<sup>1</sup>, Mohamad. Aadil<sup>2</sup>, Mohd. Aarif<sup>3</sup>, Dhruv Pandey<sup>4</sup>

<sup>1, 2</sup>Department of Mechanical Engineering, IMS Engineering College, Ghaziabad, Uttar Pradesh, India

**Abstract:** Air Pollution is increasing on our earth due to increase in the emissions. Air pollution is very serious problem on our earth. The indoor room air has also been found polluted at many places. The main component due to which the air pollution is increasing are (CO<sub>2</sub>)(SO<sub>2</sub>), (NO<sub>x</sub>) and lead which enters the atmosphere from vehicles. Such gases can be found in indoor air if the homes and buildings is located near the industrial area. The other sources include pesticides, volatile compounds from perfume, hairspray, furniture, dust mites, allergens, tobacco smoke etc. So it is required to improve the quality of room air by taking various serious attempts.

**Keywords:** Air pollution, room air, pesticides, molds, tobacco smoke.

## I. INTRODUCTION

The main objective of the project is to purify the room air. An **aqua air purifier** or **aqua air cleaner** is a device which removes pollutants from the air in a room. These devices are beneficial to allergy sufferers and aims at reducing or eliminating tobacco smoke, allergens and other pollutants. It not only removes the harmful pollutants in the air but also the irritating odour coming from various household items. The pesticides and chemicals used for cleaning household items release some kind of harmful gases. This air purifier absorbs all those gases which are harmful in nature.

### A. Effect Of Air Pollution On Human

- 1) Some health effects can appear after a single exposure or repeated exposures to a harmful pollutants. These effects include irritation of the eyes, nose and throat, headache, etc.
- 2) Other health effects can result long after exposure to pollutants. These effects include some respiratory diseases like heart disease and cancer, and can prove fatal.
- 3) Some pollutants like PM 2.5 cause breathing problems. The people living in industrial area are severely affected.
- 4) Air pollutants also increase the average temperature of earth by absorbing the solar radiation due to which people have to suffer extreme hot conditions.
- 5) The pollutants also decrease the visibility distance due to which road accidents may take place.

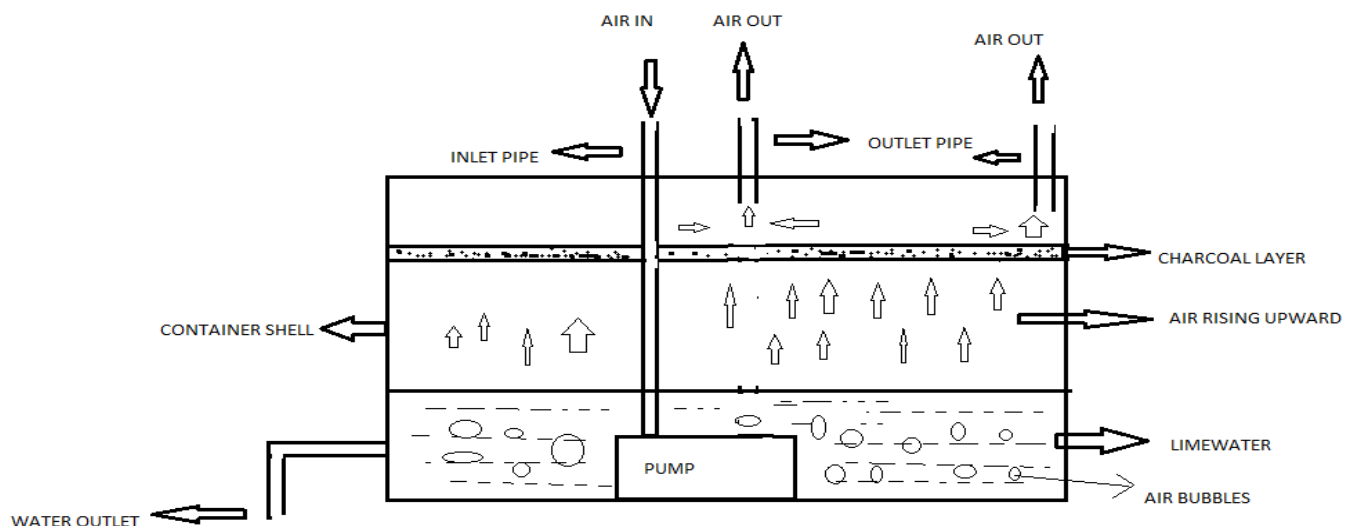


Fig 1: Basic layout of Aqua Air Purifier

The block diagram of the aqua air purifier generally shows the interconnection of all the components with each other.

## II. DESCRIPTION OF COMPONENTS USED IN PROPOSED MODEL

### A. Inlet and Outlet Pipe

The inlet is provided for sucking the indoor room air by the pump. The outlet pipe releases the fresh air into the room.

### B. Charcoal Layer

The charcoal layer has more absorbing capacity due to more surface area porosity. This charcoal is termed as ACTIVATED CHARCOAL. It is manufactured by heating the charcoal above 1450 °C due to which its surface area gets increased.

### C. Limewater Layer

The limewater is an aqueous solution of calcium hydroxide and water. This solution reacts with various impurities present in the air and forms the precipitate and the precipitate so formed settles at the bottom of the container.

### D. Container Shell

The whole setup is kept inside the container shell. The air inlet, outlet and water outlet is provided in the shell itself.

### E. Pump

A pump is installed in the container. The air is sucked and supplied through the pipes into the limewater by this pump. Once the pump power is switched on, it continues sucking the room air through the inlet pipe and releases it into the limewater.



Fig 2: Aqua Air Purifier

## III. OPERATION AND WORKING

Air is pulled by the pump and enters in the limewater causing the airborne particulate matter and pollutants getting pulled into the limewater. The impurities present in the air get mixed in the lime water and pollutants such as  $\text{CO}_2$ ,  $\text{NO}_2$ ,  $\text{SO}_2$  etc. reacts with lime water and forms the precipitate. The precipitate settles at the bottom of the container and can be washed away by outlet pipe. Further impurities are absorbed by the activated charcoal. The pure air rises upward and is released into the room.

## IV. EFFECTS OF DISSOLVED GASES ON LIME WATER

The lime water is an excellent absorbing medium. In aqua air purifier the gases are passed through inlet pipe by pump which is dipped in lime water and the impure air containing pollutants is released into the limewater.

When these pollutants are dissolved in limewater they form acids, carbonates, bicarbonates and settles in the form of precipitate at the bottom of the container.

### A. Action of Dissolved $\text{SO}_2$

When  $\text{SO}_2$  is mixed in limewater, it forms calcium sulphate ( $\text{CaSO}_3$ ), it forms Hydrogen Sulphide which causes rotten egg smell, acidify and causes corrosion of metals.



**B. Action of Dissolved CO<sub>2</sub>**

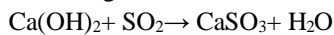
The dissolved carbon dioxide in the limewater forms bicarbonate at lower PH and Carbonates at higher PH. Calcium carbonate will be precipitated when carbon dioxide present in air will react with lime water.

**C. Effect of Dissolved NO<sub>x</sub>**

The NO<sub>x</sub> is product of emissions. The oxides of nitrogen are absorbed to a larger extent by limewater.

**A. Reactions**

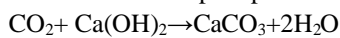
The SO<sub>2</sub> gas is removed from the air forming calcium sulphate



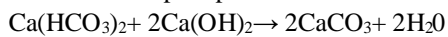
HCL is neutralized in limewater



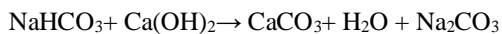
Carbon dioxide is precipitated as calcium carbonate



Bicarbonate is precipitated as calcium carbonate



Bicarbonate ions (Like NaHCO<sub>3</sub>, KHCO<sub>3</sub> etc.) are converted into carbonates



**B. Features Of Proposed Model**

Dust, particulate matter and other pollutants can act as allergens, and they can cause various allergies in sensitive people. Smoke particles and volatile organic compounds can pose a serious risk to health. So this proposed model is the initiation towards removing every type of pollutant from the room air so that the residents living in the room can be provided fresh air (free from pollutants) for breathing.

## V. CONCLUSION

An Aqua Air Purifier have high efficiency to reduce harmful gases and odour using combination of lime water and activated charcoal. Contamination of water remain very less in aqua air purifier. Due to use of water as a medium, this system is ecofriendly as the precipitate formed in the limewater can be easily washed out from the container through the water outlet. This system is cheap and affordable to all. It plays important role in room air cleaning.

## VI. ACKNOWLEDGEMENT

Before we get into thick of things, I would like to add few heartfelt words for the people who are part of our team as they have unending contribution right from the beginning of the project. Apart from the team, I am indebted to the number of person who have provide helpful and contributed guidance in the draft of material.

I acknowledge with gratitude towards the encouragement in the form of substantial assistance provided by each member of my team. I would like to extend my sincere thank to our guide Prof. Ravi Ranjan, Poject coordinator Prof. Abhishek Saxena and Head of Department of Mechanical Engineering Department Dr. V.K. Saini.

## REFERENCES

- [1] National Air Quality Index by Central Pollution Control Board
- [2] Identification and characterisation of particulate matter concentration in construction jobsites <http://www.mdpi.com/journal/sustainability>
- [3] Atomization Concept and Theory [http://wwwd.graco.com/training/concept\\_and\\_theory/Atomization%20v2.pdf](http://wwwd.graco.com/training/concept_and_theory/Atomization%20v2.pdf)
- [4] Understanding Drop Size by Rudolf J. Schick Spraying Systems Co. [http://www.spray.com/literature\\_pdfs/B459C\\_Understanding\\_Drop\\_Size.pdf](http://www.spray.com/literature_pdfs/B459C_Understanding_Drop_Size.pdf)





10.22214/IJRASET



45.98



IMPACT FACTOR:  
7.129



IMPACT FACTOR:  
7.429



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24\*7 Support on Whatsapp)