FABRICATION OF AIR PURIFIER AND HUMIDIFIER USING WATER AS FILTER

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ABSTRACT

Poor indoor air quality is commonly found in homes in larger cities, and it's result of a growing industrialization that pollutes air we breathe with contaminants like industrial dust smoke and other particles from traffic. The solution from user perspective, is to use an air purifier that clean the air from these particles inside the users home.

An air purifier can also be used to ease annoyance for people suffer from allergies. This matter thesis concerns the design and development of the next generation of the air purifier for indoor use. The project has been conducted with human centered design process and co-design approach

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Chapter 1

INTRODUCTION

Air Purifier & Humidifier using Water as a Filter:-

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.

- These devices are commonly marketed as being beneficial to allergy sufferers and asthmatics, and at reducing or eliminating second-hand tobacco smoke.

- The commercially graded air purifiers are manufactured as either small stand- alone units or larger units that can be affixed to an air handler unit (AHU) or to an HVAC unit found in the medical, industrial, and commercial industries. Air purifiers may also be used in industry to remove impurities from air before processing. Pressure swing absorbs or other adsorption techniques are typically used for this.
- Air pollution has crossed all bounds in 2021. WHO estimates that around 7 million people die every year from exposure to polluted air.

- The spread of air pollution is so high that about 91% of the world population is exposed to air pollution.

- Well this also means that the air you breathe in your house is polluted. To counter this issue we here develop a mini air purifier with that does not use expensive filters but rather uses water as an air filter. Also it acts as an air humidifier and can be used as oil diffuser too which helps you relax and also kills certain bacteria and viruses present in the air.

HUMIDIFIER:- A humidifier is a device, primarily an electrical appliance, that increases humidity (moisture) in a single room or an entire building.

- In the home, point-of-use humidifiers are commonly used to humidify a single room, while whole-house or furnace humidifiers, which connect to a home's HVAC system, provide humidity to the entire house.

- Medical ventilators often include humidifiers for increased patient comfort. Large humidifiers are used in
- commercial, institutional, or industrial contexts, often as part of a larger HVAC system.

- Low humidity may occur in hot, dry desert climates, or indoors in artificially heated spaces. In winter, especially when cold outside air is heated .

- Humidity may drop to as low as 10-20%. This low humidity can cause adverse health effects, by drying out mucous membranes such as the lining .

- Nose and throat, lead to a snoring problem, and can cause respiratory distress. The low humidity also can affect wooden furniture, causing shrinkage .
- loose joints or cracking of pieces. Books, papers, and artworks may shrink or warp and become brittle in very low humidity.

OIL DIFFUSER:- It helps to relax and killed certain bacteria and viruses present in the air

- While the air purifier uses filtration technology to eliminate pollutants from inside the living space, the humidifier helps in maintaining an optimal level of humidity in the winter season when the air gets dry leading to a range of allergies Cough, sneezing, etc.) and respiratory issues.

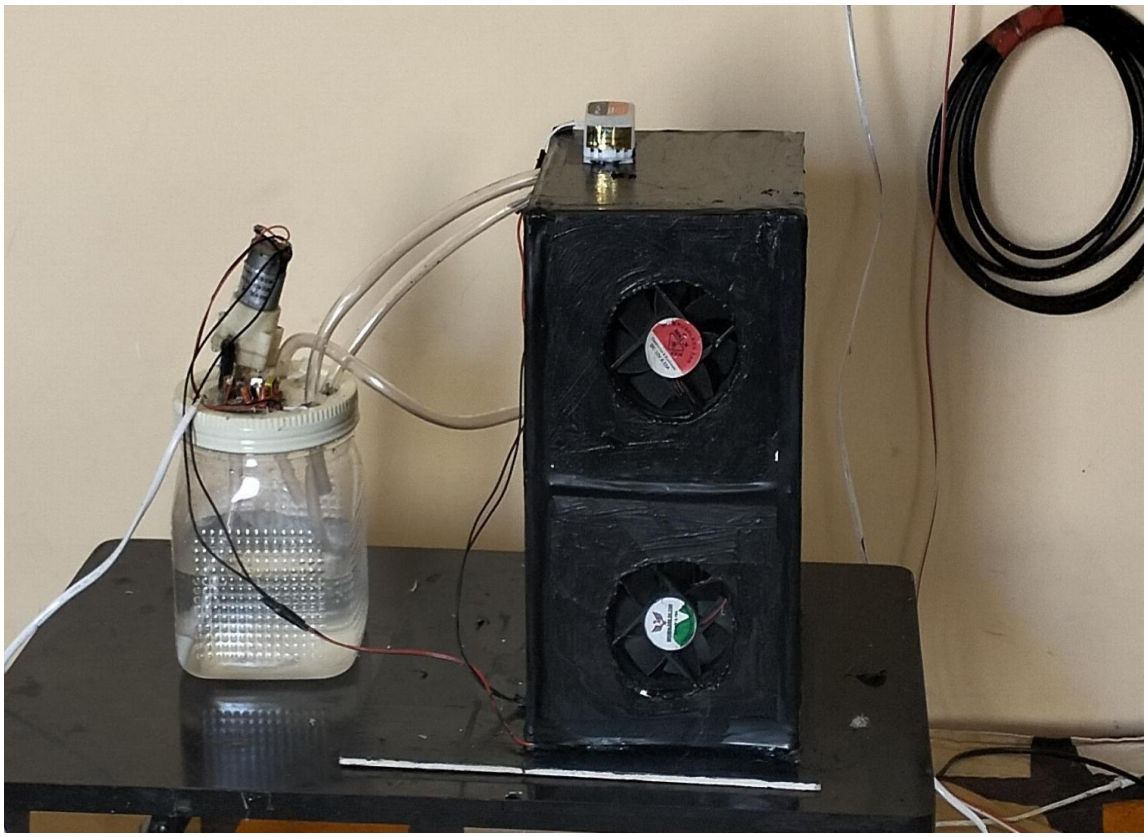


FIGURE 1 : FRONT VIEW OF MODEL (AIR PURIFIER)

SOURECES THAT CAUSES AIR POLLUTION

Air pollution has crossed all bounds in 2021. WHOestimates that around 7 million people die every year from exposure to polluted air; the spread of airpollution is so high that about 91% of the world population is exposed to air pollution? Well, this also means that the air you breathe in your house is polluted. To counter this issue, we here develop a miniair purifier with that does not use expensive filters but rather uses water as an air filter. Also, it acts as an air humidifier and can be used as oil diffuser too which helps you relax and also kill certain bacteria andviruses present in the air.

The mini–Air Purifier brings up the following key

Aspects

- A Low-Cost Purifier
- No Expensive Filters Just Water
- Quiet Operation
- Easy Maintenance
- Also acts as a Humidifier

- Low Power Consumption
- Easy To Use

Can be used as an Oil Diffuser The system makes use of 2 x high power low noise centrifugal fans that are used to suck in air through a protection mesh. The pulled air is then passed through a water tank situated at the bottom of the purifier. The air passed through water gets auto purified as water traps dust, fungi, bacteria etc. in the water.

Indoor air hazards

Ozone generators are sold as air cleaners. They make ozone gas on purpose. But high concentrations of ozone react with organic material inside and outside the body. When ozone is breathed in, it can harm the lungs. This can cause chest pain, coughing, shortness of breath, and throat irritation. It can make chronic lung diseases such as asthma worse. It can also increase the risk for lung infections.

The EPA says that research does not support claims that ozone from these devices removes dust, pollen, and chemicals from the air. No federal agency has approved these devices as air cleaners. The official number found on ozone generator packaging is only the identification of the facility that made the product. It is not an approval number.

Other indoor pollutants

These are other common household air pollutants Particulates.

These include dust and pollen.

Formaldehyde. This is a common preservative and adhesive in furniture, carpets, drapes, particleboard, and plywood paneling. Breathing formaldehyde fumes can cause coughing, rashes, headaches, dizziness, and irritation of the eyes, nose, and throat.

Household products. These include personal care products, pesticides, household cleaners, solvents, and chemicals used for hobbies. Exposure to these products can cause dizziness, nausea, allergic reactions, cancer, and irritated eyes, skin, and lungs. Some cleaning products can produce poisonous fumes. Never mix chlorine bleach and ammonia.

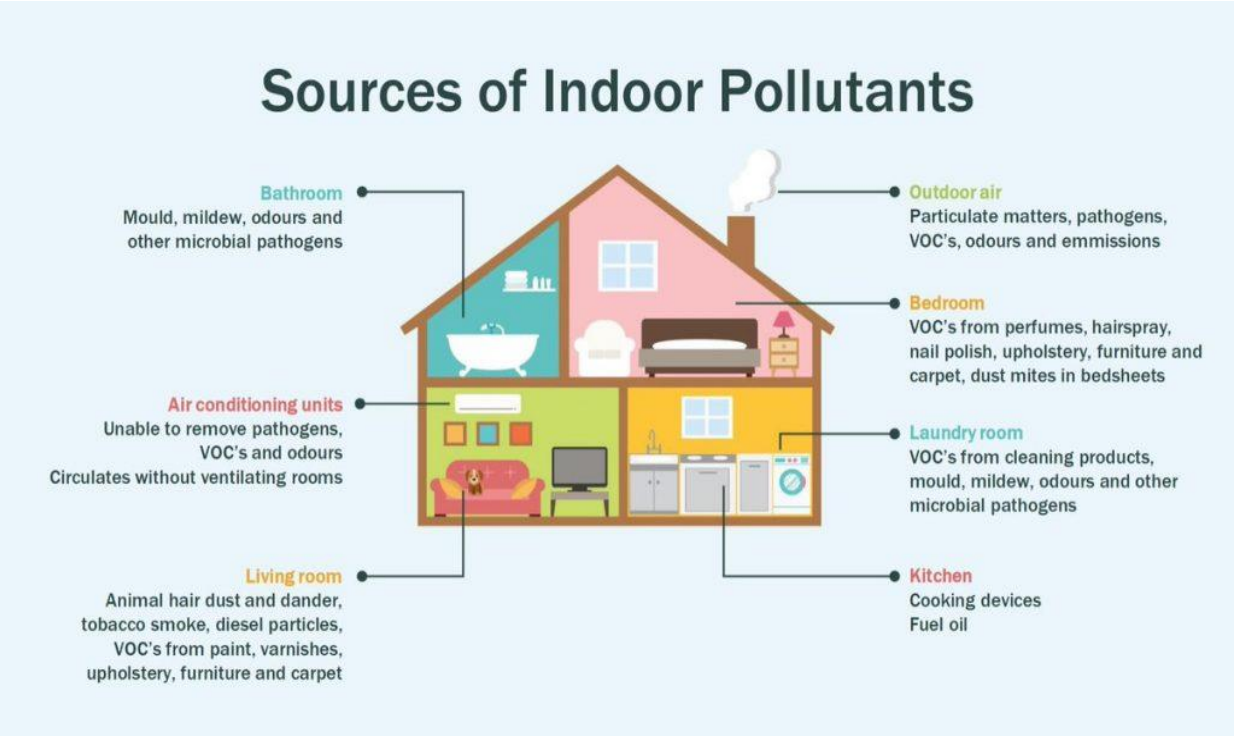
Remodeling hazards. These include new carpeting and paint. They can give off fumes that irritate the eyes, nose, and throat.

Asbestos. This may be from insulation, floor tiles, spackling compounds, cement, and heating equipment. These products can be a problem indoors only if the material that contains the asbestos is disturbed and becomes airborne. This also happens when the product falls apart with age. Asbestos fibers are light, flexible,

and small enough to stay in the air. So the fibers can be breathed in. This causes lung tissue scarring and lung cancer.

Lead. This was common in paint made before 1978.

Pesticides. Exposure to these can occur through normal use of sprays, strips filled with pesticides, and foggers (also called bombs). Exposure can also occur after using contaminated dusts. This is especially true for children who may be in close contact with contaminated surfaces. Symptoms can include headache, dizziness, muscle weakness, and nausea. Some pesticides may cause cancer.



Indoor Air Can Cause Health Problems

Are you worried about the air you breathe? Don't think you're safe just because you're inside. The Environmental Protection Agency (EPA) says that the air in homes and other buildings can be more seriously polluted than the outdoor air.

Indoor air pollution can cause big health problems. People who may be exposed to indoor air pollutants for the longest periods are often those most at risk to the effects of indoor air pollution. This includes children, older adults, and people with long-term (chronic) illnesses.

Most indoor air pollution comes from sources that release gases or particles into the air. Things such as building materials and air fresheners give off pollution constantly. Other sources such as tobacco smoke and

wood-burning stoves also cause indoor pollution. Some indoor air pollutants have been around for years. But they often were weakened by outdoor air seeping into the home. Today's more energy-efficient homes don't let as much outdoor air get inside

BEDROOM AIR

A cold mist humidifier or vaporizer can promote the growth of living pollutants. Use and clean the device correctly. Change the water daily.

Bedding should use pillows and mattress covers that block allergens. Wash regularly in water above 130° F (54° C). Vacuum under beds regularly to control dust mites.

Dry cleaning can leave gases on clothes. Air them out before taking them indoors. Think about washing by hand instead.

Air conditioners can be a home for living allergens. Clean water trays often and change filters.

Chapter 2

REVIEW OF LITERATURE

- HEPA filters were originally classified as top-secret, developed by the US Atomic Energy Commission to protect soldiers from radioactive particles on the battlefield. During World War II, scientists involved in the Manhattan Project used HEPA masks to guard against contaminants from the atomic bomb. • Although these early HEPA masks couldn’t possibly protect people from atomic radiation, the research spawned the HEPA filter, which provided protection against chlorine gas, mustard gas, and flame throwers. It was not until the 1960s that specifications were standardized and the term HEPA or "High Efficiency Particulate Air" was officially coined by the Department of Energy (DOE).

- As defined by the DOE, HEPA filters remove at least 99.97% of dust, pollen, mold, bacteria and any airborne particles with a size of 0.3 microns at 85 liters per minute. From the beginning, HEPA filters were employed

to filter out highly hazardous aerosols, toxic carcinogens, radioactive particles, and biohazardous contaminates.

- In Germany, brothers Klaus and Manfred Hammes purchased a patent for a simple air filtration system. Using a fiberglass pad attached with small magnets to the air outlet of a residential oil oven, the Hammes brothers were able to filter soot from the air. In 1963, the 31 Hammes brothers simple but effective filter became the first air cleaner to be utilized in homes across Germany.

- In the same year, US Congress passed the Clean Air Act of 1963 to set standards for the reduction of air pollution through fuel emissions standards. Although it was not Congress first attempt at reducing air pollution, the Clean Air Act of 1963 alerted scientists and consumers of the need to protect our lungs from pollutants such as perfumes, building materials, chemicals, pesticides, and allergens.
  No longer classified as top-secret, HEPA air filters became popular in the 1970s and 1980s as more consumers became concerned about air pollution. With the introduction of dozens of products featuring HEPA filters, new and exciting ways to control allergies and asthma finally became widely available for residential use. Originally, the first HEPA air purifiers were bulky, difficult to operate, and traditionally used only in hospital and pharmaceutical settings and among computer chip manufacturers. Then businesses began to take notice of indoor air quality concerns among residential consumer.

- In response to the growing demand for cleaner air, Incen AG, the Hammes brothers newly formed company moved to Switzerland and began developing and manufacturing residential air purifiers in 1971. After many years of international success for Incen AG, Frank Hammes, son of Klaus Hammes, began to distribute cabin air filters as add-on accessories for Mercedes-Benz automobiles in 1990.

- In 1991, Frank Hammes formed IQAir North America, which has promoted the continual growth and success of the air purification industry.

- In 1991, through the amazing technology of True Medical HEPA and Activated Carbon, Richard Taylor created a filter that addressed the issues of environmental particulate contamination, chemical toxicity, and odours. It was then that he and his wife Joyce founded Austin Air Systems Limited. Based out of Buffalo, NY,

Austin Air introduced a pre-filter that ensured a HEPA filter life unequaled to anything in the industry. Austin Airs 360-degree intake system draws air into all sides of the air cleaner, maximizing efficiency and delivering more clean air faster. With the largest air cleaner manufacturing facility in the world, Austin Air continues to produce all the parts for their fantastic air purifiers.

- Established in 1992, AllerAir quickly became a trusted name in air purification. After a family member of AllerAir founder Sam Teitelbaum developed Multiple Chemical 32 Sensitivity (MCS), Teitelbaum and partner Wayne Martin decided to develop their own air cleaner. Using the combination of true HEPA filters and a MAC-B (mass activated carbon bed) filters, which contain pounds of carbon, AllerAir created an air purifier that safely and effectively removes chemicals, gases, and odours from the air. With offices in the United States, Italy, and Canada, AllerAir air purifiers are used by the Mayo Clinic, IBM, Gucci, Prada, and the U.S. Army. With more than 100 model to choose from, Aller Air cleaners are efficient, practical, and cost effective.

- Now a global leader in the production of specialty products and chemicals and a subsidiary brand of Kaz, Honeywell started as a hot water heater company in 1906 and has a longstanding tradition of supplying safe, reliable, and high-quality products. Acquired by Kaz in July of 2002, Honeywells indoor air quality products continually meet and exceed the American Lung Associations Health House guidelines with meaningful innovations based on consumer research and insights. With the use of permanent, lifetime HEPA filters, Honeywell air cleaners remove 99.97% of all common, household particles such as dust, pollen, tobacco, smoke, and cat dander. The Honeywell glass-fiber HEPA material helps remove airborne particles without the use of expensive ultraviolet bulbs, chemicals, or other treatments. With a diversity of products to fit your needs, Honeywell offers a series of Home Comfort and Indoor Air Quality Solutions.

In 2002, IQAir air purifiers became the first air cleaners to incorporate H13 class certified HEPA filters, which capture up to 100 times more particles than conventional HEPA filters. H13 class certified HEPA filters, up to that point, had only been used in hospital clean rooms.

- Although no longer a top-secret government project, air purifiers still hold the secrets to cleaner air and healthier environments for many asthma and allergy sufferers. Today HEPA air purifiers and filters are used in a variety of critical filtration applications in nuclear, 33 electronic, aerospace, pharmaceutical and medical fields, as well as in homes around the world.

Chapter **3**

METHODOLOY

3. METHODOLOGY

Basic principle of Air Purification

- Air purifier is usually equipped with a fan that absorbs air and Lets the air pass through a filter media where particles Purifier is a device which removes contaminants from the air in a room.

- These devices are commonly marketed per particles.

- Behind the pre-filter, some air cleaning technology, Usually a finer filter, captures smaller sized particles (Figure 1).

- The air that comes through is clean from harmful particles. Air purifier is a device which removes contaminants From the air in a room.

- These devices are commonly marketed As being beneficial to allergy sufferers and asthmatics.

- At reducing or eliminating second-hand tobacco smoke.

- An air handler unit (AHU) or to an HVAC unit found in the Medical, industrial, and commercial industries.

- Purifiers may also be used in industry to remove impurities such as CO From air before processing.

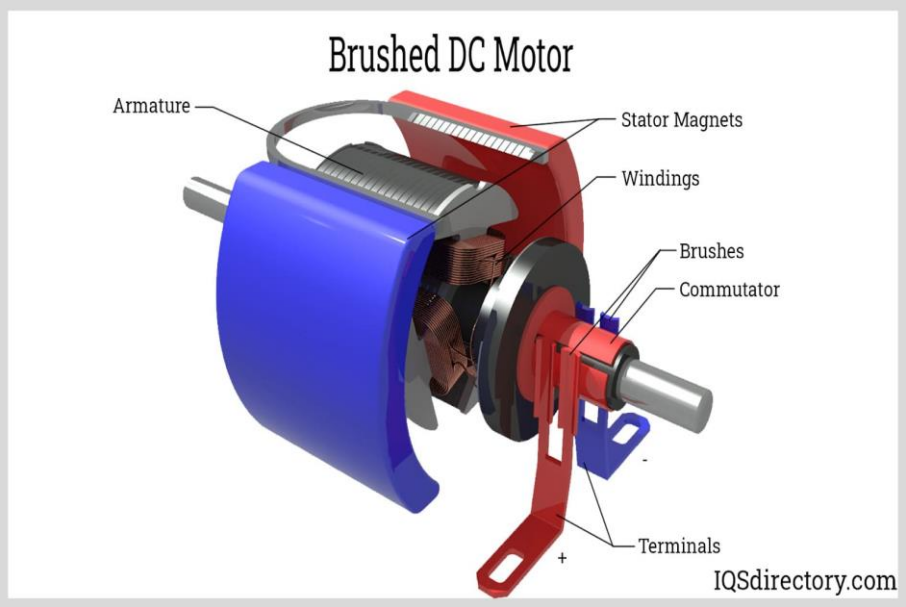
Component:-

1. Air Blower Pump or centrifugal pump.
2. Air Suction pump.
3. Pipe, Pipe Fitting.
4. Protective three mess filter.
5. Mounts and Joints.
6. Base Frame.
7. UV light.
8. Water Tank.
9. Pipe Fittings.
10. Nozzle.
11. Pipe Connector.
12. Transformer/Adapter.
13. Monitoring System.
14. Frame Supporting Frame.

Fig. 2. Centrifugal Fan

COMPONENTS:-

Centrifugal Fan 12V: To move air through a duct in your home, a centrifugal fan is generally utilized in domestic applications. Consider your furnace, range hood, or air conditioning system. These might also be present in commercial settings, such as your car wash. A DC motor has an internal configuration of magnets with diametrically opposed voltages. A powerful magnetic field is created as current flows through the coil encircling this configuration. The motor then rotates as a result of the torque produced by this magnetic field.



WORKING MECHANISM:-

The motor, fan, screen for the air filter, and other systems account for a significance of the air purifier. The machine's motor and fan circulate the air inside, and the polluted air is then removed from the space or absorbed after passing through the air filter screen inside the machine. Some models of air purifiers also implement a negative ion generator at the air outlet (when operating, the high voltage in the negative ion generator will produce DC negative high voltage), which will continuously ionize the air and generate a significant amount of negative ions.

PARTS OF SILENT AIR PURIFIERAND HUMIDIFIER:-

Adaptor or Transformer main purpose of adaptor is to convert alternate current (AC) to direct current (DC).

- Air blower pumps or centrifugal pumps:- these pumps are used to suck the air from the atmosphere and transports the air through the fans to pipes.

- Pipes:- The pipes are attached to the air blower pumps. It transports the air from air blower pumps to water tank.

- Nozzle:- Nozzles are attached at the end of the pipes which are used to increase the velocity of the air.

- Mounts and joints :- these mounts and joints are used to create a base for the air blower pumps.

- Base frame:- Base frame is used to create a base for the system.

- Supporting frame:-these are used to support the system and also as side frames of the system.

- Screws and fittings.

Figure 2:- Side view Air purifier

Pre filter

- The pre filter traps large particles such as dust, oil, and carbon from the . It's the first stage of filtration,
- It essentially helps to capture large particles. It's washable also.

Figure 3. Pre filter

Bike filter

- The filter is meant to separate dirt and dust particles, and which get suspended in the air.
- range in size from 5-120 microns (some larger, some smaller).

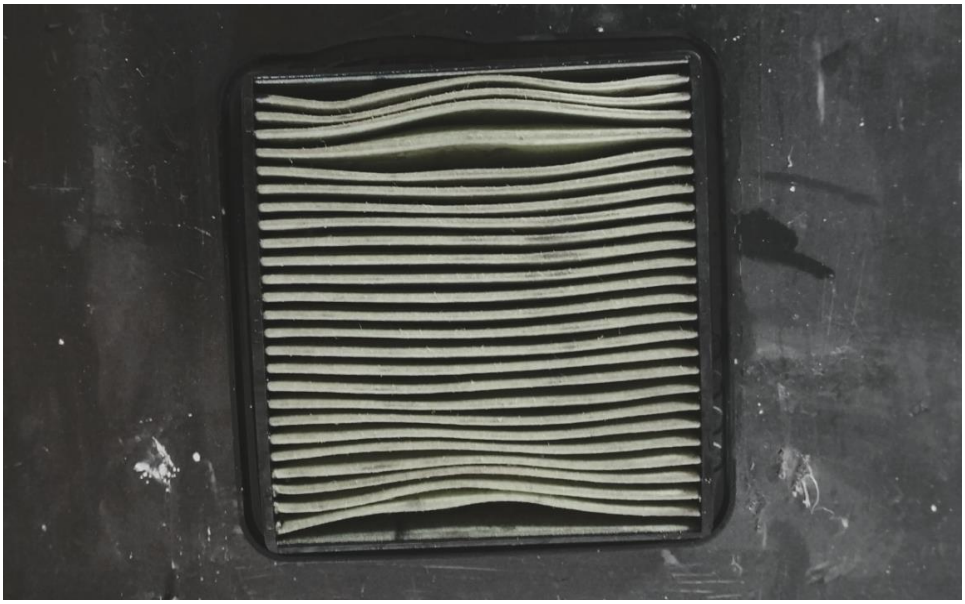


Figure 4. Bike filter

Cotton air filter

- They are able to filter finely up to 7 microns, And with the quality of easily-washable.

Figure 5. cotton filter

UV LIGHT

- In a UV air filter system, UV (Ultraviolet) rays kill the harmful bacteria from the air.
- Hence the air is completely disinfected from pathogens. The UV air purifier is good for health because it kills all the harm full microbes present in the water without affecting the taste.
- **(FIG.6 . UVLIGHT)**

Suction pump

A suction pump works by atmospheric pressure; when the piston is raised, creating a partial vacuum, atmospheric pressure outside forces water into the cylinder, whence it is permitted to escape by an outlet valve. The nozzles pipes transports 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. **(Fig. 7. suction pump)**

There are two types of air purifying technologies, active and passive.

- Active air purifiers release negatively charged ions into the air, causing pollutants to stick to surfaces, while passive air purification units use air filters to remove pollutants.
- Passive purifiers are more efficient since all the dust and particulate matter is permanently removed from the air and collected in the filters.[13] Several different processes of varying effectiveness can be used to purify air.
- As of 2005, the most common methods were high-efficiency particulate air (HEPA) filters and ultraviolet germicidal irradiation (UVGI).

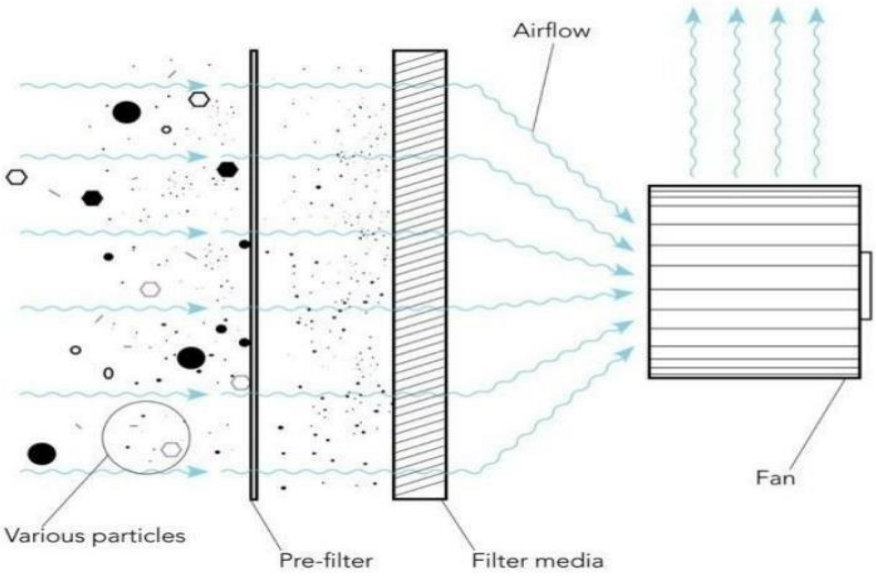


Figure:1

Operation :-

- 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 converts the electrical energy into mechanical energy and the fans starts 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 transports 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.

METHODS :-

- The most common methods are fiber filtration and electrostatic dust removal. Activated carbon filtration is still the most common method for gas purification, and ozone and ultraviolet radiation are the most commonly used sterilization techniques.

- Collection on porous filter media is perhaps the most efficient means of particle removal. Aerosol filtration is an effective means of air purification, while at the same time it has been widely used for sampling airborne material for mass and chemical composition determination.

- <u>The best air purifiers include:</u>

➢ HEPA Filtered Air Purifiers
➢ Carbon Activated Filtered air purifier
➢ UV Light Purifiers
➢ Negative Ion Generators
➢ HEPA Air Purifiers

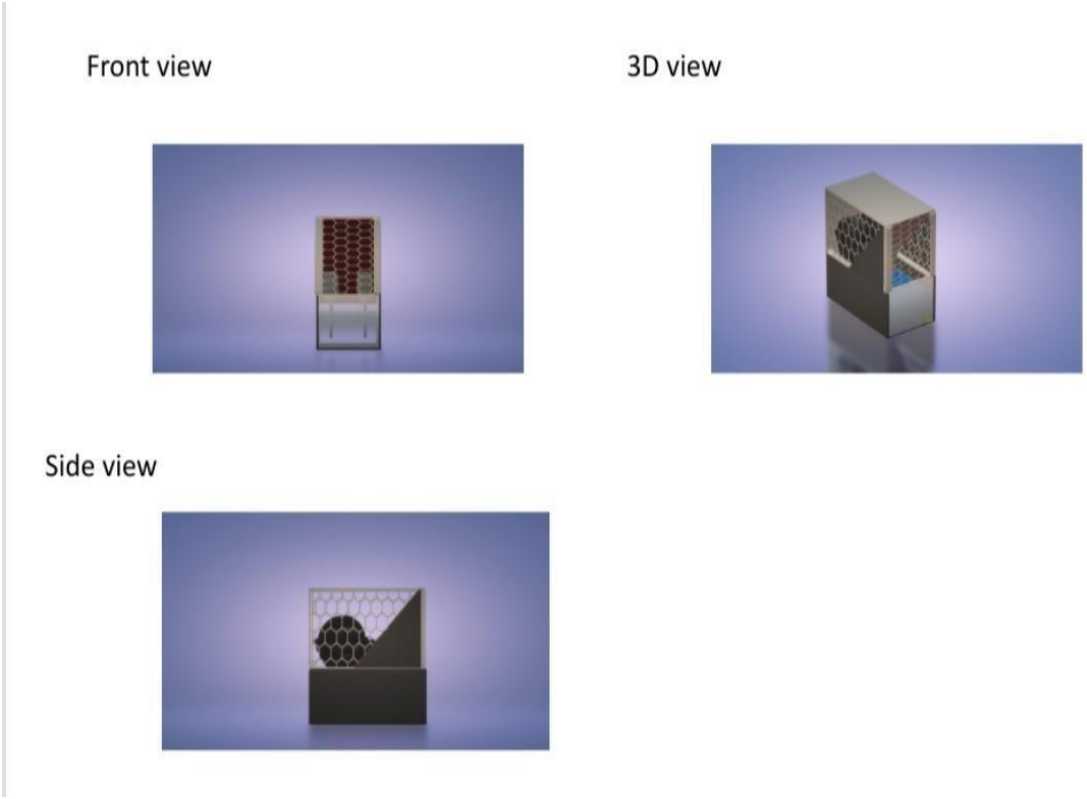
One of the best and most common ways to purify our home's air is with a HEPA filter (high-efficiency particulate air). They can trap 99.97% of all airborne particles in the air, including pollen, dust mites, and pet dander. This makes it a great choice for those who suffer from allergies or asthma. However, a HEPA filter can be expensive to replace and often requires regular cleaning.

Benefits:

- Traps 99.97% of all particles Great for people with allergies or asthma Removes various air pollutants or airborne viruses, bacteria, mold, and dust Easy to clean and maintain Can come in portable air cleaners.

Disadvantages:

- HEPA replacement filters are expensive to replace Maintenance is easy but expensive Can be noisy.



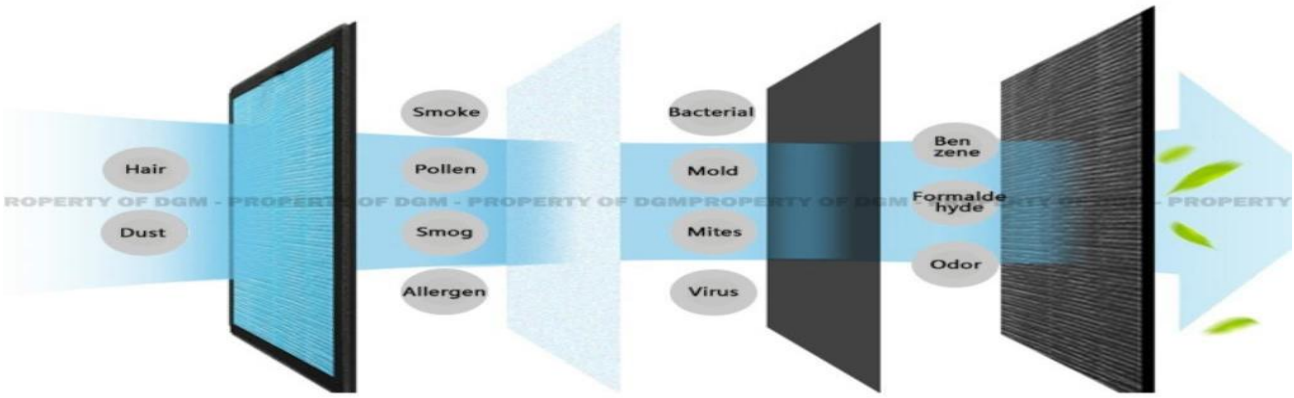
FILTERATION:-

- Air filter purification traps airborne particles by size exclusion. Air is forced through a filter and particles are physically captured by the filter. Various filters exist notably including:

- High-efficiency particulate arrestance (HEPA) filters remove at least 99.97% of 0.3-micrometer particles and are usually more effective at removing larger and smaller particles.[15] HEPA purifiers, which filter all the air going into a clean room, must be arranged so that no air bypasses the HEPA filter. In dusty environments, a

HEPA filter may follow an easily cleaned conventional filter (pre filter) which removes coarser impurities so that the HEPA filter needs cleaning or replacing less frequently. HEPA filters do not generate ozone or harmful byproducts in the course of operation.

- Filter HVAC at MERV14 or above are rated to remove airborne particles of 0.3 micrometers or larger. A high-efficiency MERV 14 filter has a capture rate of at least 75% for particles between 0.3 and 1.0 micrometers. Although the capture rate of a MERV filter is lower than that of a HEPA filter, a central air system can move significantly more air in the same period of time. Using a high-grade MERV filter can be more effective than using a high-powered HEPA machine at a fraction of the initial capital expenditure. Unfortunately, most furnace filters are slid in place without an airtight seal, which allows air to pass around the filters. This problem is worse for the higher-efficiency MERV filters because of the increase in air resistance. Higher-efficiency MERV filters are usually denser and increase air resistance in the central system, requiring a greater air pressure drop and consequently increasing energy costs. (Fig. 8 Air filteration process)



Steps of Air Filtration

Table 1
/Wr purifier specifications

Type	Specification
Weight	*11*
Airflow rate Turbo/H/M/L/Silent	*450/330/240/150/60 m J/h*
Humidifying operation Turbo/H/M/L/Silent	*450/330/240/150/120 m Vh*
Sound pressure level — Air purifier mode Turbo/H/M/L/Silen t	*50/43/36/26/17 dBA*
Sound pressure level — Humidifier mode Turbo/H/M/L/Silent	*50/43/36/26/23 dBA*
Power input Air purifier Turbo/H/M/L/S i I ent	*0.081/0.035/0.018/0.011/0.008 kW*
Power input Humidifier mode Turbo/H/M/USilent	*0.084/0.037/0.02/0.013/0.012 kW*
Humidifier mode Turbo/H/M/L/Silent	*600/470/370/290/240 ml/h*
Water tank capacity	*4.0 litres*
Air filter	*Polypropylene net with catechin*
Dust collecting method	*Plasma ionizer/Electrostatic dust collection filter*
Dimensions (Height x Width x Depth)	*590/395/268 mm*

- Fibrous media air filters remove particles from the air. Activated carbon removes gases from the air. This uses a high voltage wire or carbon brush to remove particles from the air. The negative ions interact with the air particles, causing them to attract to the filter or other objects in the room.

- Streamer Discharge Technology.
- 6-stage filtration process.
- Streamer deodorizing catalyst-decomposes odour.
- Plasma duct collection-Collects dust and pollen.
- Titanium apatite photocatalytic filter-Traps microscopic particle.

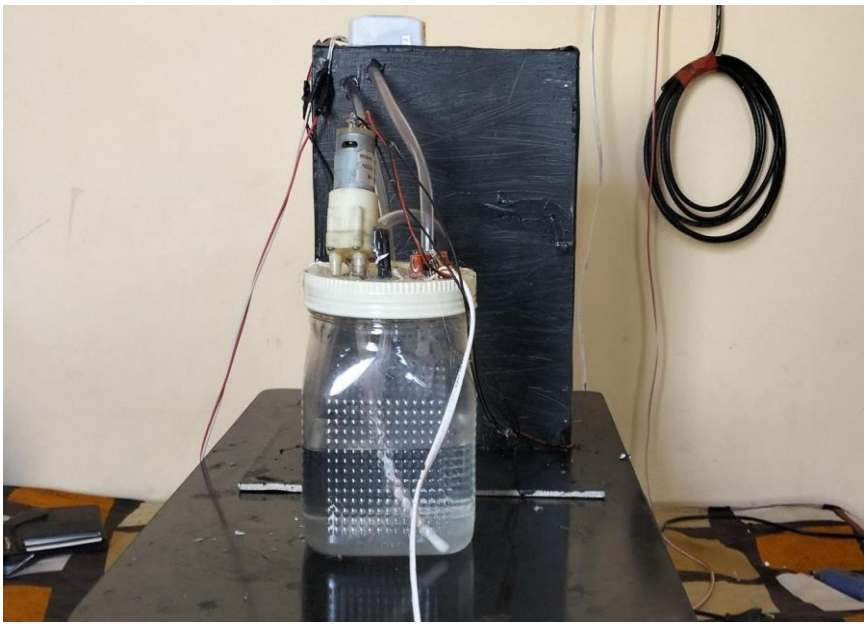
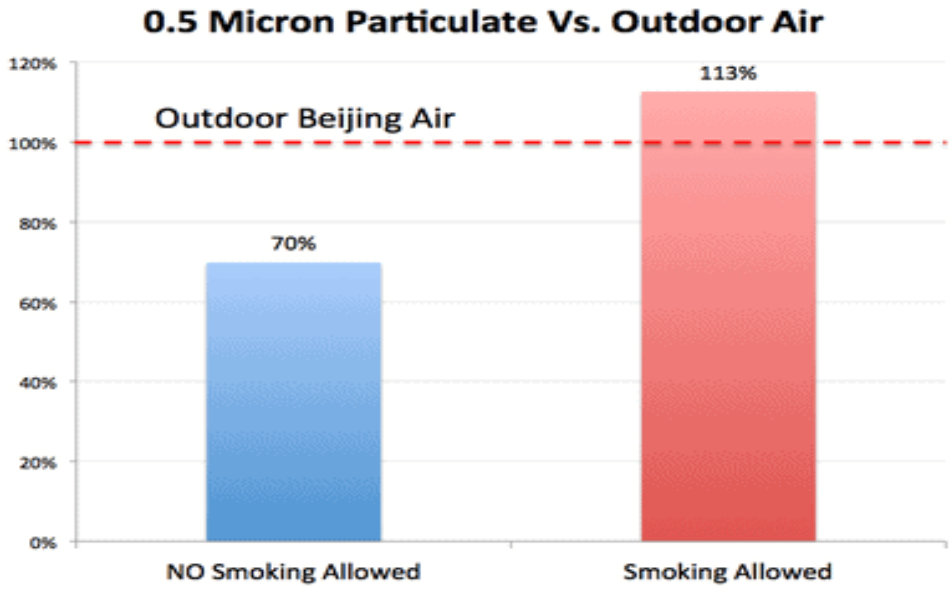


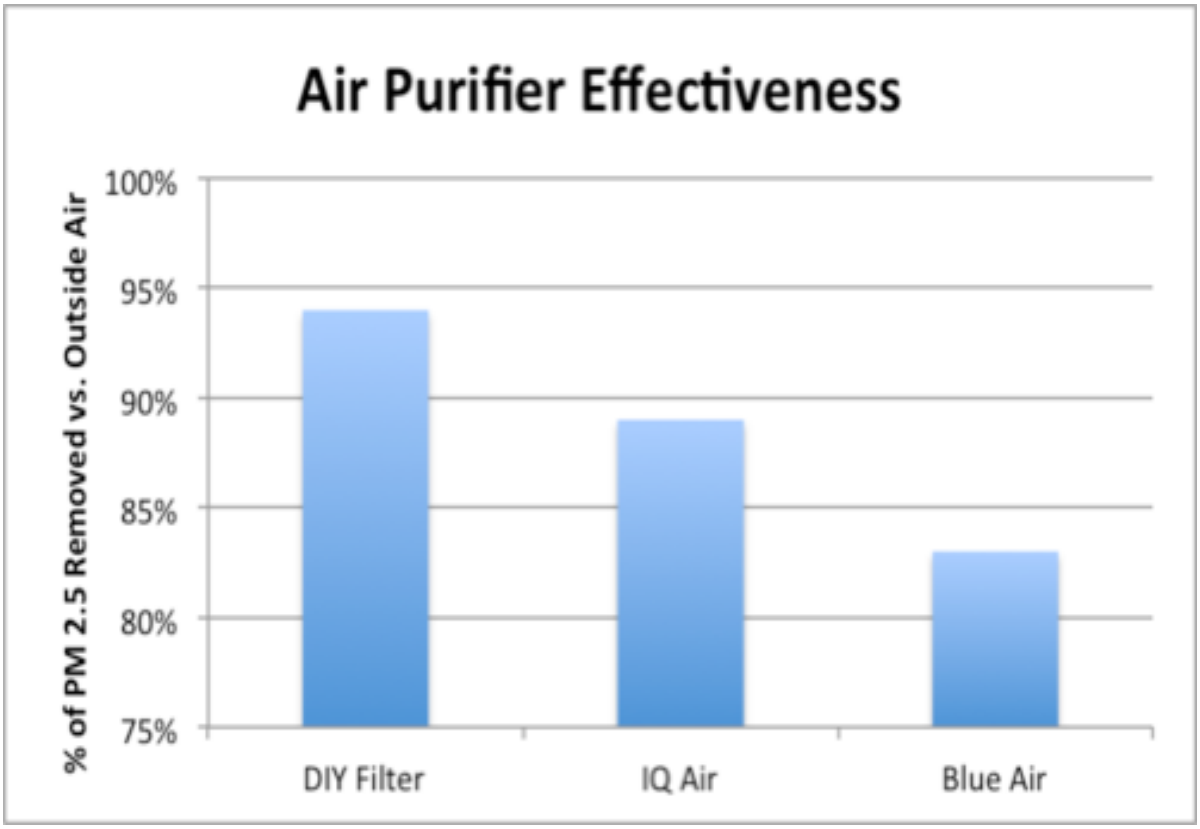
Fig.9 . Air purifier with components

TABLE.2 AIR QUALITY ANALYSIS

EU Air Quality Directive				WHO Guidelines	
Pollutant	Averaging period	Objective and legal nature and concentration	Comments	Concentration	Comments
$PM_{2.5}$	Daily			25 $\mu g/m^3$	99th percentile (3 days/year)
$PM_{2.5}$	Annual	Limit value, 25 $\mu g/m^3$		10 $\mu g/m^3$	
PM_{10}	Daily	Limit value, 50 $\mu g/m^3$	Not to be exceeded on more than 35 days per year	50 $\mu g/m^3$	99th percentile (3 days/year)
PM_{10}	Annual	Limit value, 40 $\mu g/m^3$		20 $\mu g/m^3$	
O_3	Maximum daily 8-hour mean	Target value, 120 $\mu g/m^3$	Not to be exceeded on more than 25 days per year, averaged over three years	100 $\mu g/m^3$	
NO_2	Daily	Limit value, 200 $\mu g/m^3$	Not to be exceeded more than 18 times a calendar year	200 $\mu g/m^3$	
NO_2	Annual	Limit value, 40 $\mu g/m^3$		40 $\mu g/m^3$	

GRAPH REPRESENTATION





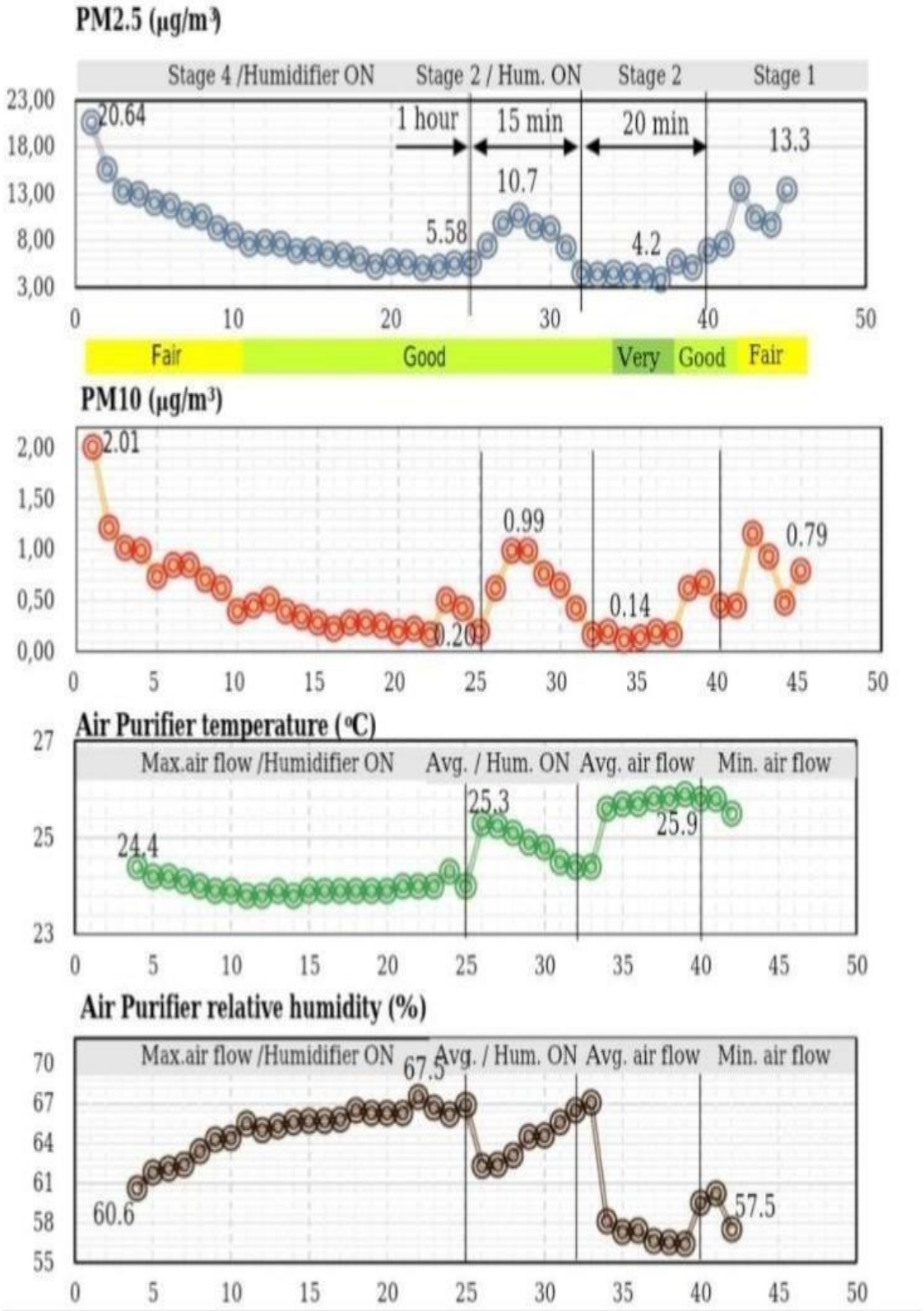


Fig. 2 – PM2.5, PM10, Purifier temperature and relative humidity variations during different stages in the living room

- **TABLE 3 . MERV AIR FILTER RATING**

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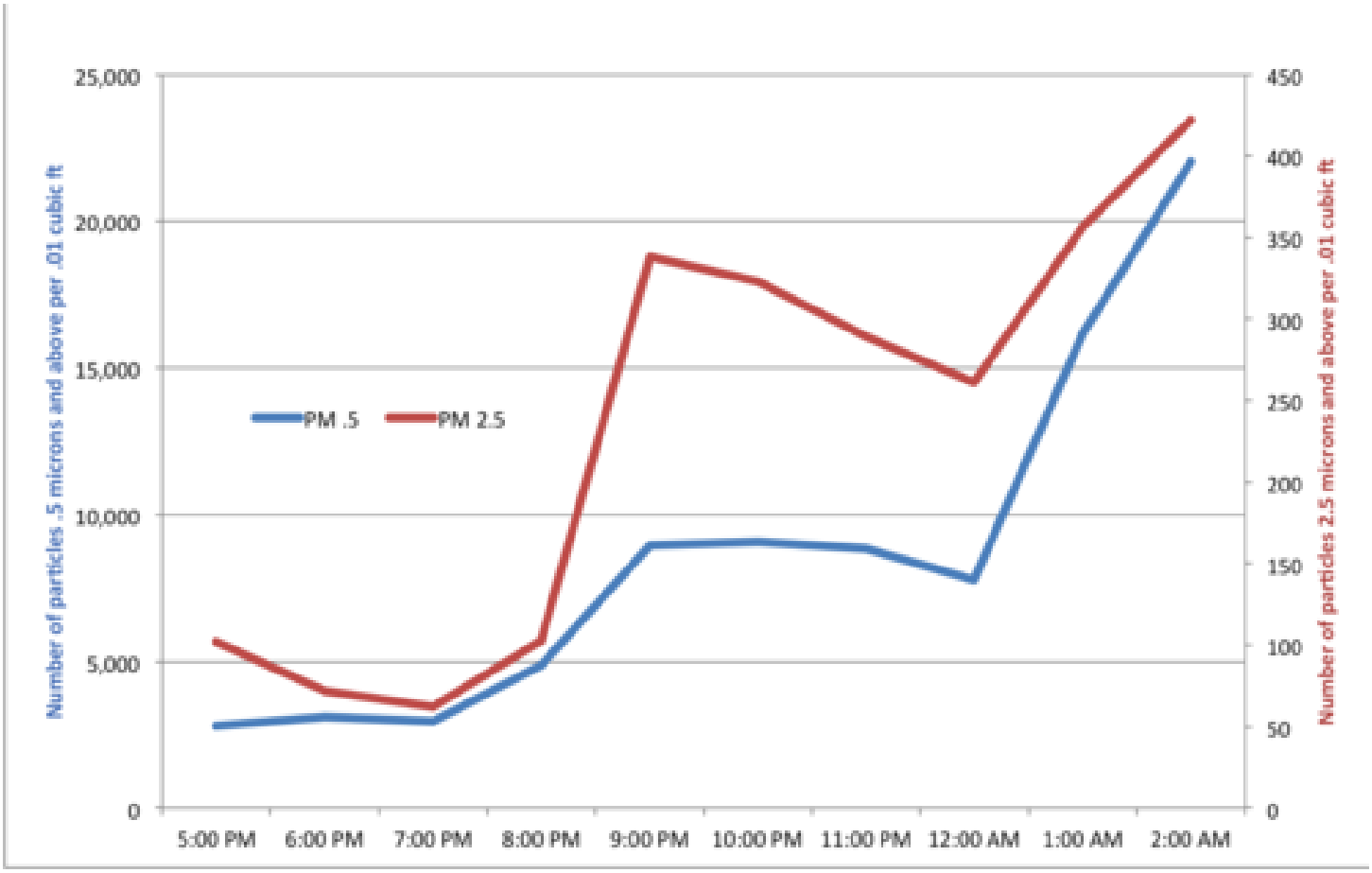
MERV Rating	Air filter will trap particles sized .3 to 1.0 microns	Air filter will trap particles sized 1.0 to 3.0 microns	Air filter will trap particles sized 3.0 to 10 microns	Filter Type & Particles Removed
MERV 1	<20%	<20%	<20%	Fiberglass and Aluminum Mesh pollen, dust mites, spray paint, carpet fibers, pet dander
MERV 2	<20%	<20%	<20%	
MERV 3	<20%	<20%	<20%	
MERV 4	<20%	<20%	<20%	
MERV 5	<20%	<20%	20% - 34%	Disposable Filters mold spores, kitchen aerosols, hair spray, furniture polish, household cleaning sprays
MERV 6	<20%	<20%	35% - 49%	
MERV 7	<20%	<20%	50% - 69%	
MERV 8	<20%	<20%	70% - 85%	
MERV 9	<20%	>50%	85% or better	Home Box Filters lead dust, flour, auto fumes, welding fumes
MERV 10	<20%	50% - 64%	85% or better	
MERV 11	<20%	65% - 79%	85% or better	
MERV 12	<20%	80% - 90%	90% or better	Commercial Filters bacteria, wildfire smoke, respiratory droplets
MERV 13	>75%	90% or better	90% or better	
MERV 14	75% - 84%	90% or better	90% or better	
MERV 15	85% - 94%	95% or better	90% or better	
MERV 16	95% or better	95% or better	90% or better	
MERV 17	99.97%	99% or better	99% or better	HEPA and ULPA viruses, carbon dust
MERV 18	99.997%	99% or better	99% or better	
MERV 19	99.9997%	99% or better	99% or better	
MERV 20	99.99997%	99% or better	99% or better	

ISO-Aire
Clean Air Technology
www.ISO-Aire.com

- **Graph for bedroom air quality**



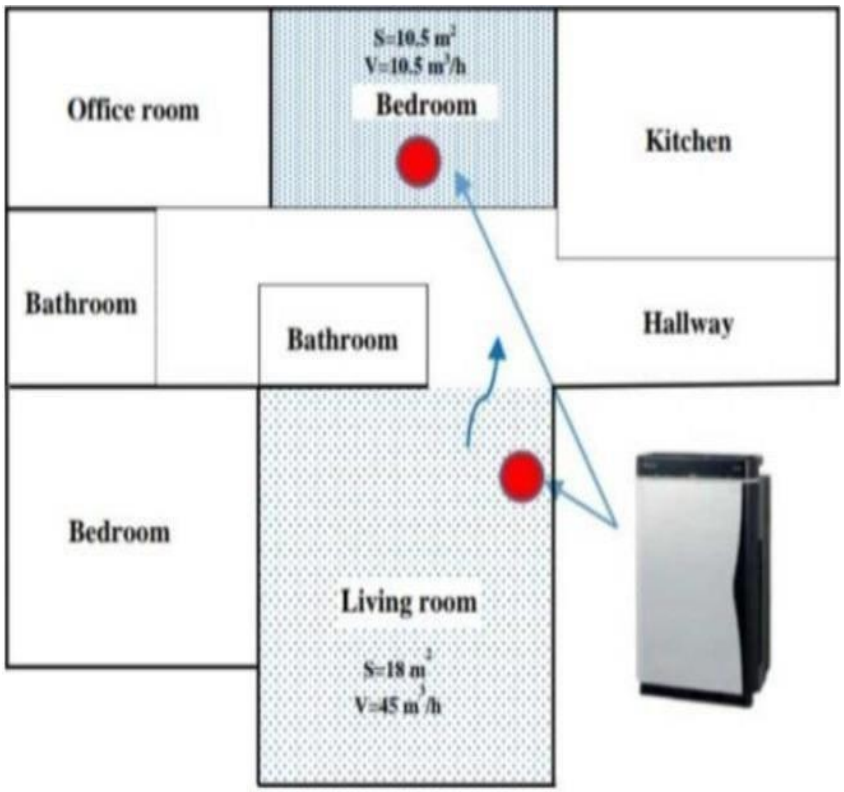


Fig. 1 - Schematic drawing of the campaign used during the experimental tests and the position of measurements

USE AND BENEFITS :-

- Dust, pollen, pet dander; mold spores, and dust mite feces can act as allergens, triggering allergies in sensitive people.
- Smoke particles and volatile organic compounds (VOCs) can pose a risk to health.
- Exposure to various components such as VOCs increases the likelihood of experiencing symptoms of sick building syndrome.

- Relieves Symptoms of Asthma.
- Eliminates Harmful Chemicals from Indoor Environments.
- Neutralizes Unpleasant Odors.
- Reduces the Chances of Airborne Diseases.
- Improves Sleep.
- Removes Harmful Radon.
- Eliminates Hazardous Asbestos Particles. Can Increase Life Expectancy.

- Activated charcoal is a natural air purifier. It's odour less, highly-adsorptive, and eliminates toxins from the air making it fit to breathe. Charcoal is a natural alternative to air purifiers making the air of your home breathable and healthy.

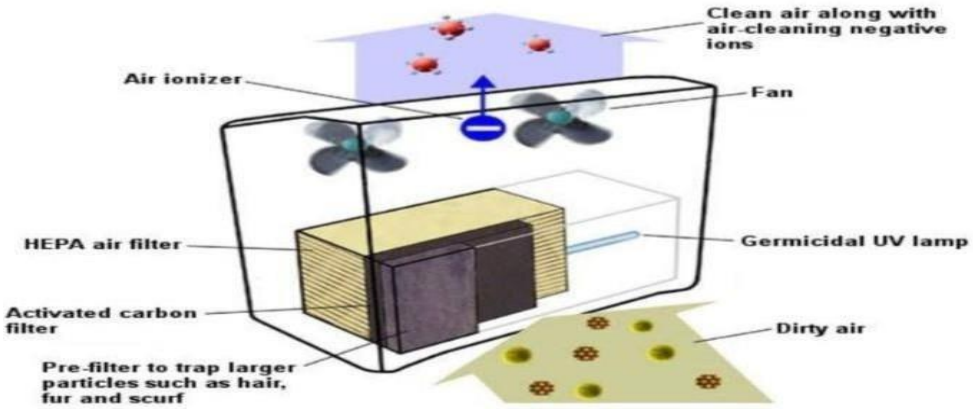


Figure 10. working

FUTURE SCOPE

- The increase in outdoor pollution in Indian cities is mostly caused by an increase in the number of vehicles on the road, intense construction, and industry. It is clear that with a booming economy with more than 125 billion people to feed, more trees will be felled and land will be made available for infrastructure. Therefore, these activities will have repercussions. All of these are becoming hazardous, starting with the groundwater, the crops, and the air. Obviously, the future generations will pay a high price for our careless behaviour.

- We require awareness and actions that can, at the very least, lighten the load on our one and only planet.

- The majority of us is in charge of how much food and drink we consume, but the air we breathe are completely neglected. The increase in respiratory complaints, particularly in youngsters, indicates that pollutants are having a serious negative impact on the respiratory system. Additionally, it is obvious from the rise in your visits to the doctor or medication.

- Wheezing, sneezing, coughing, asthma, and a number of other illnesses, such as heart attacks and lung cancer, are all brought on by air pollution. In order to prevent pollution from entering the air and maintains a clean and pure atmosphere, it is crucial to do more than only filter the air inside of buildings. Air purifiers are just as important in the modern world as water purifiers.

- Studies conducted by the British Allergy Foundation and others have shown that breathing air that has been cleaned and purified by Sharp air purifiers reduces the amount of toxins that enters our bodies, reducing the need for medicine or time off from work. Since they are overly focused on lowering dust or other particles and have been distracted from the real need and benefits that a consumer expects, this is absent from the majority of brand commitments.

Chapter 4

CONCLUSION

4. Conclusion

- The outcome of this project is a next generation air purifier with a new filter innovation.
- 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.
- The air purifier is a product that solves the problem of bad indoor air quality.
- The air purifier developed in this project is also more environmentally sustainable than competitors in the existing market.

Chapter 5

REFERENCES

5. REFERENCES

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6. Following websites links have been used in the completion of this project .

7. :- nevon projects(https://nevonprojects.com)

8. :- help from internet

9. :- O2 Cure https://o2cure.in