

ApaH-Machine to Generate Water from Air

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Abstract - - ApaH machine is a hybrid machine concept where the water will be generated based on of atmospheric air. The water droplets are generated through condensing unit and stored in a separate bottom storage tank. Collected water purified by separate four filtration process. After filtration, these safe drinking water will be stored in a separate upper storage tank. The proposed solution emphasizes on the use of safe drinking water with low cost and environment friendly. Implementing this system will enable us to reduce the water scarcity and operating cost of water filtration is very less.

Key Words: condensing unit, booster pump, carbon filter, TCR filter, ozone generator, renewable.

1 .INTRODUCTION

The atmosphere air contains the water in the form of humidity, water vapour etc. This amount of water contain atmospheric air can be used with the help of ApaH Water Generator machine. This machine is capable of converting atmospheric air humidity directly into the usable and even safe, pure drinking water. The ApaH machine uses the principle of latent heat convert into the water droplets or vapour molecules. In many countries like India, there are many places or regions which are situated in the temperate region; there are rain forest areas, desert areas and also flooded areas where atmospheric air humidity is eminent. In the past few years some of the research projects have already been done to establish the proof or concept of atmospheric air condensation as well as generation of water. So, this research project will be helping to extend the applications of such machine further in the near future. According to previous research, we know that the temperature is required to condensation water is known as the dew-point temperature. Here, the goal is to obtain the specific temperature practically proven or experimentally to condense the water with the help of some electronics machines. This project consists of a conventional compressor and evaporator system is used to the condensation of water by simply exchange the latent heat of coolant or fluid inside the evaporator section. The condensed water will be passed to separate four filters to pure and safe for drinking purpose and various other uses.

2. DESCRIPTION OF THE PROBLEM

The major adverse effects of water scarcity are also observed in various countries of the world. It's due to lack of rainfall, global warming and pollution of water resources. In

India it is difficult to get water resources for drinking, irrigation, household and other purposes, like in arid regions. Now, a day's people are using ground water for drinking purpose by filtration process. In the mean while the purification cost becomes very high. A less expensive filtration and water can be generated from renewable air is the solution to the problem.

3. DESCRIPTION OF THE PROPOSED SOLUTION

The proposed solution is ApaH that can convert atmospheric moisture content directly into the usable safe drinking water with less expensive and environment friendly. Power required for the atoms will be renewed using a solar power continuously.

4. POTENTIAL BENEFITS OF THE ApaH

Implementing this system will enable us to reduce the water scarcity problem in the world and hence, there will be a simultaneous fall in the price of water-filtration. By this solution the ApaH become more efficient over time. This will provide a self sustainable process for drinking water.

5. DESCRIPTION OF THE DESIGN PROCESS

In this design process of ApaH machine, ApaH will be carried out in a condensing unit; it will absorb the atmospheric moisture content from air to generate water droplets. That water droplets are stored in a separate stainless steel bottom storage tank with a capacity of 13 lit. By the help of booster pump it will create pressure to flow the water into the four filtration process to purify the water like pre carbon filtration, sediment filtration, carbon filtration and TCR filtration. After filtration, these safe drinking water will be collected and stored in a separate stainless steel storage tanks with a capacity of 9 lit that will be fitted with water level indicator sensors which will monitor the rate of water generation, water consumption and water level in the storage tank. Ozone generator is connected with the upper storage tank to decolorize, deodorized and disinfect the collected water.

ApaH is a hybrid machine which is having a separate port for the tap water purification. The direct tap water connection is connected to the bottom storage tank and will get filtered by separate four filtration process to convert tap water into safe purified drinking water.

6. ApaH MAJOR COMPONENTS

AIR FILTER

In ApaH, we are using high efficiency particulate air (HEPA) filter. This air filter it will absorb or arresting the solid particulates such as mold, bacteria, pollen, dust from the atmospheric air. ApaH air filter is made up of fibre and its also remove the odors, gaseous pollutant like ozone or volatile organic compounds from the atmospheric air. Air filters are used to improve the air quality in ApaH machine.

COMPRESSOR

An air compressor is a machine that compressed the air and stored in pressurized air or compressed air. Air compressor it store more and more air into a storage tank to increase a high pressure and high temperature. When storage tank its reached more pressure then air compressor shuts off automatically. When storage tank pressure it reached low pressure then air compressor it will turn ON again and re-pressurizes the tank.

CONDENSOR

The condenser systems involving the heat exchanger or heat transfer, a condenser is a pair of copper and aluminium device, its used to convert gaseous state to liquid state, by cooling it. Condensers are a type of heat exchanger or heat transfer and its have different designs and come in a different sizes ranging from small scale unit to very large industrial-scale unit. Condenser system its a heart of the ApaH machine.

BOOSTER PUMP

Booster pump is a small reverse osmosis diaphragm; It's able to boost a water pressure from 20 PSI (Pascal square inch) to 80 PSI. Booster pumps working by a rotatable motor moving a diaphragm to create a piston movement to sucking water through inlet port and forcing water out through the outlet port. Booster pump it's plumbed in with a low pressure water sensor to prevent dry running and also added a high pressure water sensor to cut power to the booster pump when the water storage tank is full.

SEDIMENT FILTER

Sediment filter used to remove the suspended particles such as silt, clay, loose scale, sand or any organic material from the collected water. when untreated water is passes through the sediment filter chamber, which traps the suspended particles on the surface of chamber or within the filter.

ACTIVATED PRE-FILTER

Activated pre-filter is used for removing chlorine, ammonia, carbon monoxide from the drinking water. It's also helps to filtering organic matters like algae, leaves, etc.. Activated pre-filters that easily absorb the pollutants like pesticides and also have a lining of activated silver its help to kill the bacteria and virus present in water.

TCR FILTER

The Total Contaminant Removal (TCR) carbon-filter contains carbon membrane with large pores. The membranes in the TCR filter chamber help to removing colloidal particle and pathogenic organisms. TCR filter its traps the organic contaminate escaped from the reverse osmosis process. Usually its a final process of the water purification.

OZONE GENERATOR

Ozone generator its a powerful oxidant compare to the chlorine. ozone is used to deodorize, decolorize, disinfect, decompose organic substance in drinking water.

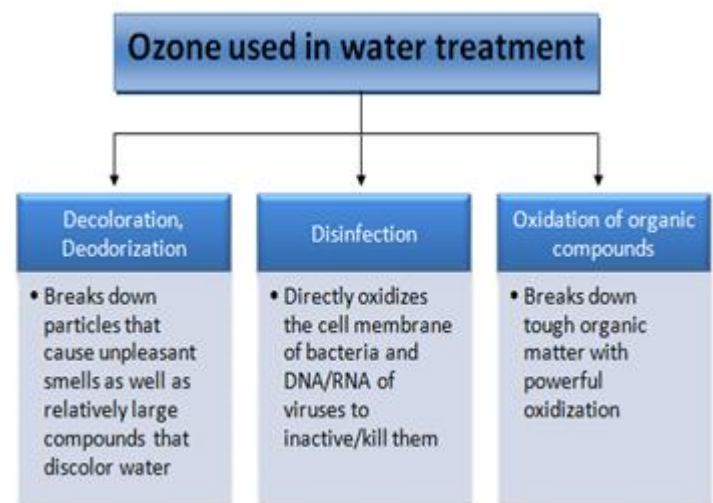


Fig- 1: ozone water treatment process

7. WORK PLAN

In a Atoms water generator, a compressor circulates the cooling through a condenser section and then an evaporation coil it cool the Atmospheric air surrounding it. The lowers temperature of air its dew points, causing water to condense. A controlled speed electric fan sucks the Atmospheric filtered air over the coil. The resulting water is then stored into a separate bottom tank with purification and separate four filtration process to keep the water safe, pure and reduced the risk by bacteria and virus which may be collected from the Atmospheric ambient air on the evaporation section by the condensing water. After filtration the safe drinking water is stored into a separate upper storage tank. Ozone generator is placed on the upper tank and it will kill the bacteria and virus present in the water. Now, the water is safe to drink from ApaH.

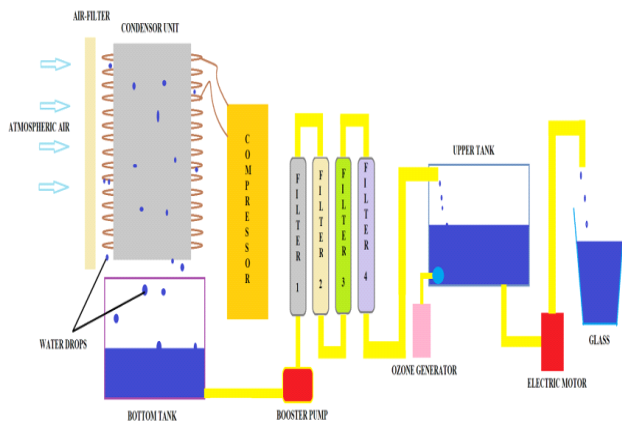


Fig - 2 : Detailed work plan

8. NOMENCLATURE OF SET-UP IN ApaH:

Air Filter



Fig -4: Airfilter installed in ApaH

Atmospheric air it will enter the condenser section through air filter. Air filter removing the solid particulates such as mold, bacteria, pollen, dust from the Atmospheric air.

Water generated from the condenser unit because of heat exchanger.

Generated water droplets its stored in the separate bottom storage tank made up of stainless steel and booster pump sucking a water through inlet port and created a pressurized water out through the outlet port.

Lower tank and Booster pump



Fig - 3: Water droplets formed during the process

The ApaH do not work efficiently when the temperature falls below 18°C or the Atmospheric air humidity drops below 30%. This means they are relatively ineffectual when located inside air-conditioned house or office.

Relative humidity % = Moisture in Atmospheric air / Maximum moisture in Atmospheric air can be hold at current temperature (x100). Hence more humidity in the Atmospheric air and cooler its surrounding the temperature, then more will be the water output.



Fig-5 : Lower tank and Booster pump

Now, water its pass to the sediment filter, activated pre-filter and carbon filter to remove the suspended particles such as silt, clay, loose scale, sand, chlorine, ammonia from the collected water.

Filters



Fig - 6 : Filters

Now, water is passed to the TCR filter to remove colloidal particle and pathogenic organism.



Fig -7 : TCR filter

Water stored in a separate upper tank made up of stainless steel. Capacity of storage tank is 13 litre.

Upper tank



Fig - 8 : Upper tank

Ozone generator is connected to the upper tank. Ozone is used to kill the bacteria and virus from the water.

12V Motor



Fig - 9 : 12 volt electric motor

If we switched ON, we can collect the drinking water from the upper tank through the 12 volt electric motor.

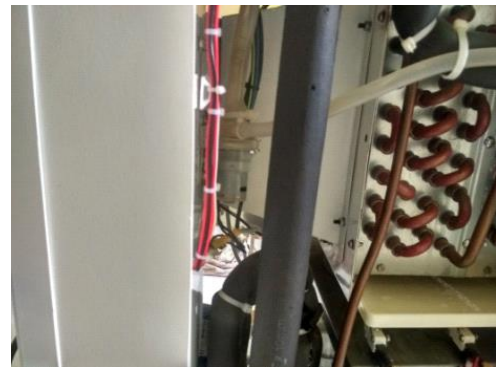


Fig - 10 : 12 volt DC motor

Now, purest water is generated from the ApaH machine.

9. ADVANTAGE

1. Clean and pure water can be obtained due to multi-filtration process.
2. Eliminates hazards caused by bacteria , virus and heavy metal contaminants.
3. Rich oxygen contained in water improves metabolism of our body.
4. It is eco-friendly and energy efficient.
5. It can run on solar energy.

10. RESULT:

S.NO	PARAMETERS	REQUIREMENTS AS PER IS 10500-2012	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	RAW WATER	RO WATER	CONDENSED WATER	PURIFIED WATER
1	COLOUR (TCU)	5	15	<5	<1	<5	<1
2	ODOUR	AGREEABLE	AGREEABLE	AGREEABLE	AGREEABLE	AGREEABLE	AGREEABLE
3	CONDUCTIVITY	-	-	1081µs/cm	73µs/cm	1015µs/cm	112µs/cm
4	TURBIDITY, NTU	1	5	<0.1	<0.1	3.7	<0.1
5	PH value	6.5-8.5	NO RELAXATION	8.5	5.9	7.9	5.8
6	TOTAL DISSOLVED SOLIDS	500mg/l	2000mg/l	730mg/l	49mg/l	680mg/l	75mg/l
7	TOTAL HARDNESS (as CaCO ₃)	200mg/l	600mg/l	460mg/l	18mg/l	320mg/l	38mg/l
8	CARBONATE HARDNESS (as CaCO ₃)	-	-	290mg/l	8mg/l	210mg/l	38mg/l
9	NON CARBONATE HARDNESS (as CaCO ₃)	-	-	170mg/l	10mg/l	110mg/l	<1mg/l
10	PHENOPHTHALEIN ALKALINITY (as CaCO ₃)	-	-	10mg/l	NILL	20mg/l	NILL
11	TOTAL ALKALINITY (as CaCO ₃)	200mg/l	600mg/l	290mg/l	8mg/l	210mg/l	38mg/l
12	CALCIUM (as Ca)	75mg/l	200mg/l	96mg/l	4mg/l	84mg/l	6mg/l
13	MAGNESIUM (as Mg)	30mg/l	100mg/l	41mg/l	1mg/l	26mg/l	5mg/l
14	CHLORIDE (as Cl)	250mg/l	1000mg/l	200mg/l	12mg/l	204mg/l	19mg/l
15	SULPHATE (as SO ₄)	200mg/l	400mg/l	31mg/l	<0.1mg/l	33mg/l	1.8mg/l
16	IRON (as Fe)	0.3 mg/l	NO RELAXATION	<0.01mg/l	<0.01mg/l	<0.01mg/l	<0.01mg/l
17	NITRATE (as NO ₃)	45mg/l	NO RELAXATION	0.5mg/l	<0.1mg/l	0.4mg/l	<0.1mg/l
18	SILICA (as SiO ₂)	-	-	37mg/l	<1mg/l	24mg/l	<1mg/l

11. CONCLUSION

It is advantageous to use ApaH machine to generate drinking water from Atmospheric air. In initial stage we have successfully collected one litre of water within one hour with relative humidity of 60% to 70% in Atmospheric air within this period, power consumption is 1 kilowatt-hours of

energy per litre of water generated from ApaH machine. Our aim is to extracting humidity from the Atmospheric air and then purifying it into the purest drinking water by collected from the condensation through a separate four ultrahigh quality filters that kills the virus, germs, bacteria, etc., that present in the water. The final result is cleanest, safest, purest water as well as great tasting.

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