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Atmospheric Air Water Generator

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ABSTRACT:In current scenario lack of Drinking Water is the most prominent issue in the world. The atmospheric air comprises large amount of water in the form of fog, water vapor, mist etc. in which 30% of water is wasted. Under this situation the climatic conditions of many regions are suitable for generating water. This moisture content is processed by condensation principle to produce fresh water that may be used as distilled water in laboratory and further purification leads to improve purity level of the drinking water. Wind spins the wind turbine which spins internal fan blades that direct air into the condensation chamber. As the warmer air cools into the chamber the water vapor condenses onto the sides, flowing into the reservoir. Here cooling is produced by Natural Condensation and hot air is passed to cooling medium and when it reaches dew-point it starts condensing water from air. The obtained water from air contains excess of contaminants such as bacteria, nitrate, odour, ammonium etc. these toxic substances are removing by using bio filtration method. In this research filter medium is constructed by extraction of coconut waste Activated charcoal.

KEYWORDS:AWG, Condensation chamber, Condensation, Dew Point, Extraction, Natural, Vertical Wind Turbine.

I. INTRODUCTION

The total area of Earth contains 75% water and only 25% land. In which 97% of water is salty that is a high percentage of total amount of water, leaving only 3% as fresh water. From this fresh water 2/3 is frozen in snow and ice in glaciers, ice caps. This leaves only about 1% of all the Earth's water that used for drinking purpose which makes it a very inadequate natural resource. If that was not enough, most of the liquid fresh water is stored underground in aquifers. Groundwater is water stored under the surface of the Earth. But, like rocks or other types of matter, water on the Earth is flowing. It is constantly moving around the hydrosphere, the layer of the Earth where water is present. It moves around by changing in three different phase that make up the water cycle.

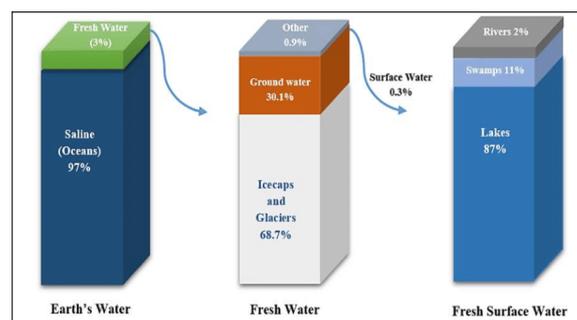


Fig 1. Distribution of water on Earth

1.1 Atmospheric air water generator

An Atmospheric Water Generator (AWG) is a device that take out water from humid air. Water vapor from the air can be extracted by condensation i.e., cool down the air below dew point, exposing the air to desiccants, or pressurizing the air and render the water potable. For our project we will be working on the water seer technology. The water seer device is planted about six feet into the ground or situated over artificially created ground conditions. The sides of the underground chamber are cooled by the surrounding soil. Wind spins the wind turbine which spins internal fan blades that direct air into the condensation chamber. As the warmer air cools into the chamber the water vapor condenses onto the sides, flowing into the reservoir. Extracted water can be pulled out from the reservoir using simple hose and pump. Because sides of the underground chamber are always cooler than the air the water seer always collecting water day and night even when there is no air flow.

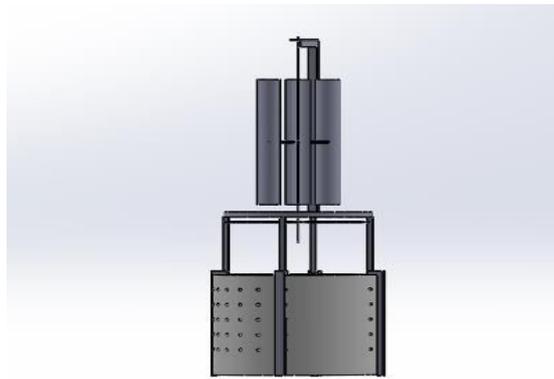


Fig 2. Air Water Generator

1.2 Humidity

Humidity A measurement of the amount of water in the air that is added to the air by the process of evaporation. Higher the humidity, the wetter it feels outside. According to the weather reports, humidity is usually explained as relative humidity. Relative humidity is the amount of water vapor actually in the air that is the ratio of the current absolute humidity to the highest possible absolute humidity which depends on the current air temperature and expressed as a percentage of the maximum amount of water vapor the air can hold at the same temperature. Global climate conditions affect by humidity in two ways.

Water vapor in the atmosphere contains latent energy. During evaporation, this heat is removed from surface of liquid and decrease the temperature of the earth's surface. This is the biggest non-radiative cooling effect at the surface. It compensates for almost 70% of the average net radiative warming at the surface.

Water vapor is the most plentiful of all greenhouse gases. It absorbs the infrared energy radiated upward by the earth's surface. This selective absorption causes the greenhouse effect. According to weather.com the average humidity in India's various cities (region wise)

Table No. 1

Southern India

Average daily humidity

Place	State	%
Bangalore	Karnataka	65
Chennai	Tamil Nadu	70
Hyderabad	Telangana	56
Minicoy	Lakshadweep	77
Pamban Island	Tamil Nadu	76
Port Blair	Andaman & Nicobar	79
Thiruvananthapuram	Kerala	78
Vishakhapatnam	Andhra Pradesh	72

Table No. 2

Northern India

Average annual humidity

Place	State	%
Agra	Uttar Pradesh	56
Allahabad	Uttar Pradesh	59
Amritsar	Punjab	65
Indore	Madhya Pradesh	50
Ludhiana	Punjab	63
Mukteswar	Uttarakhand	66
New Delhi	Delhi	54
Srinagar	Jammu and Kashmir	70



Table No. 3

Western India

Annual relative humidity

Place	State	%
Ahmedabad	Gujarat	55
Kota	Rajasthan	44
Mumbai	Maharashtra	75
Nagpur	Maharashtra	53
Panaji	Goa	76
Pune	Maharashtra	59

Table No. 4

Eastern India

Annual relative humidity averages

Place	State	%
Bhubaneshwar	Orissa (Odisha)	70
Cherrapunji	Meghalaya	81
Dibrugarh	Assam	79
Guwahati	Assam	77
Kolkata (Calcutta)	West Bengal	71

1.3 Condensation

Condensation is the process in which water vapor change their phase and becomes liquid. Condensation happens either by the air is cooled to its dew point i.e. Natural condensation or it becomes saturated with water vapor. For this project we are going to use natural condensation process. In this process due to rotation of the windmill shaft exhaust fan will rotate, due to this rotation of the fan temperature of humid air around that region cool down and it reaches to its dew point and condensation take place.

1.4 Dew point

A The temperature at which water vapor in any static or moving air column will condense into water is called Dew Point It also define as the air is saturated and cannot hold the moisture at this temperature. When the air temperature decreases below its dew point, excess moisture will be released in the form of condensation.

1.5 Natural Ventilation

Natural ventilation is the intentional passive flow of outdoor air into a building through plant opening. Natural Ventilation does not require mechanical system to move outdoor air. Instead, it relays entirely on passive physical phenomena, such as wind pressure, or the stack effect. Natural Ventilation opening may be fixed or adjustable. Adjustable opening may be controlled automated, controlled by operable, or a combination of both. Cross Ventilation is also known as natural ventilation.

II. APPARATUS

We used following equipments for our research Project.

2.1 Vertical Windmill

The Vertical Axis Wind Turbine is a type of wind turbine, and it is normally use for residential purposes to provide a renewable energy source to the home and Industries. This turbine includes the rotor shaft and four blades where the rotor shaft moves vertically. When wind strike over the blades, The Blades resist wind due to this thrust force generated which rotate the blades and shaft. Dimension of vertical wind mill is as follow 50cm, 2mm thickness, 37mm arc.



Fig 3 Vertical Wind Mill

2.2 Shaft

A shaft is a rotating mechanical element, generally circular in cross section, which is used to transmit power from one part to another, or from a machine which produce power to a machine which observes power. Length of shaft is 820mm and diameter is 4mm.



Fig 4. Shaft

2.3 Exhaust Fan

Exhaust fan is a device which is using for removing moisture content from any desire region in our project we are using exhaust fan to provide atmospheric moisture for condensation purpose.

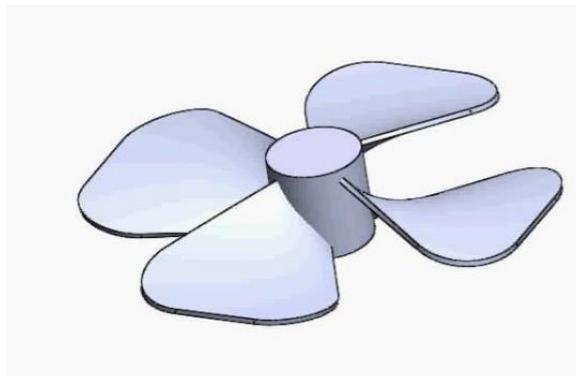


Fig 5. Fan

2.4 Bearing

A bearing is a mechanical element that constrains relative motion to only the desired motion and minimize friction between to moving part. Rotary Bearing hold rotating component such as shafts within mechanical system, and transfer axial and radial loads from the source of the load to the structure supporting.



Fig 6. Bearing

2.5 Frame

Frame is known as skeleton of any structure or body. An open structure that gives shape and support to something like any structure, mechanical system, building etc. dimension of clamber as follow diameter of disk is 75mm, thickness is i.5mm, number of clamps are four and length of clamp is 8cm, 3cm thickness and 3mm width.

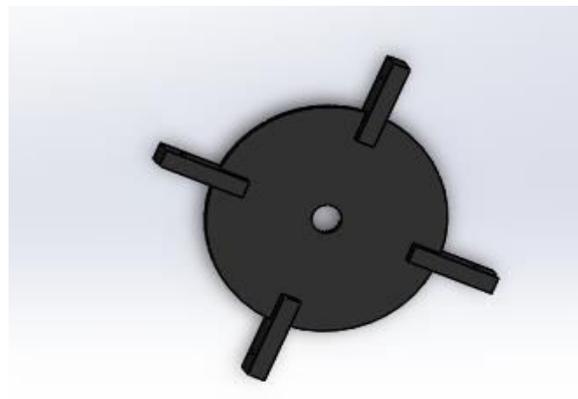


Fig 7. Clamber

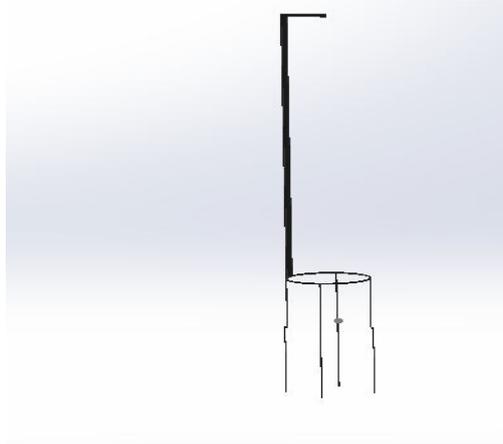


Fig 8. Frame

2.6 Clay Pot

Pot is generally use for holding water. In our project it is used as natural condensation process and water storage.

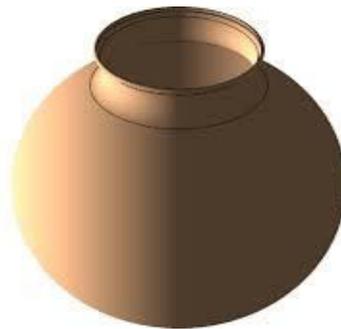


Fig 9. Clay pot

2.7 Casing

The main purpose of casing is to surround all sides of object, covering any space or gap left between the structure and frame of the object.

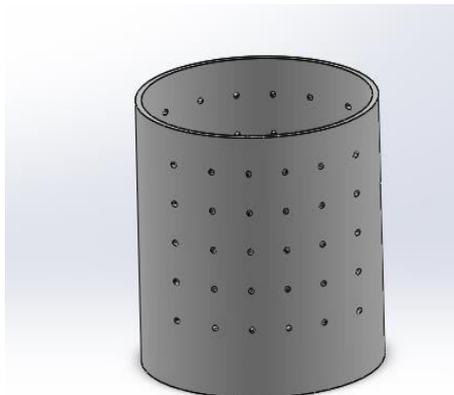


Fig 10. Casing

III.METHODOLOGY

As per identification of problem we started to work on this project to reduce scarcity of drinkable water into society. Initially we identify various process to produce water and reduce scarcity, finally we select one process which is based on principal of natural condensation in this we are utilizing atmospheric air to generate water. We are using vertical wind mill for this purpose, when atmospheric air strike on wind mill it start rotating and this blades mounted



over a vertical shaft and this shaft is connected to the exhaust fan, frame and bearing to reduce friction and provide smooth rotation and frame provide structural support to the shaft. Due to rotation of blades shaft start rotate and an exhaust fan connected at the end of this shaft which is also start rotational motion and inhale atmospheric air into the condensation chamber. In condensation chamber we are using natural condensation process to separate water content from humid air once this process takes place remaining air exhausted by the vent provided over the casing and water is generated then water is collected into another pot using nozzle and pipe system.

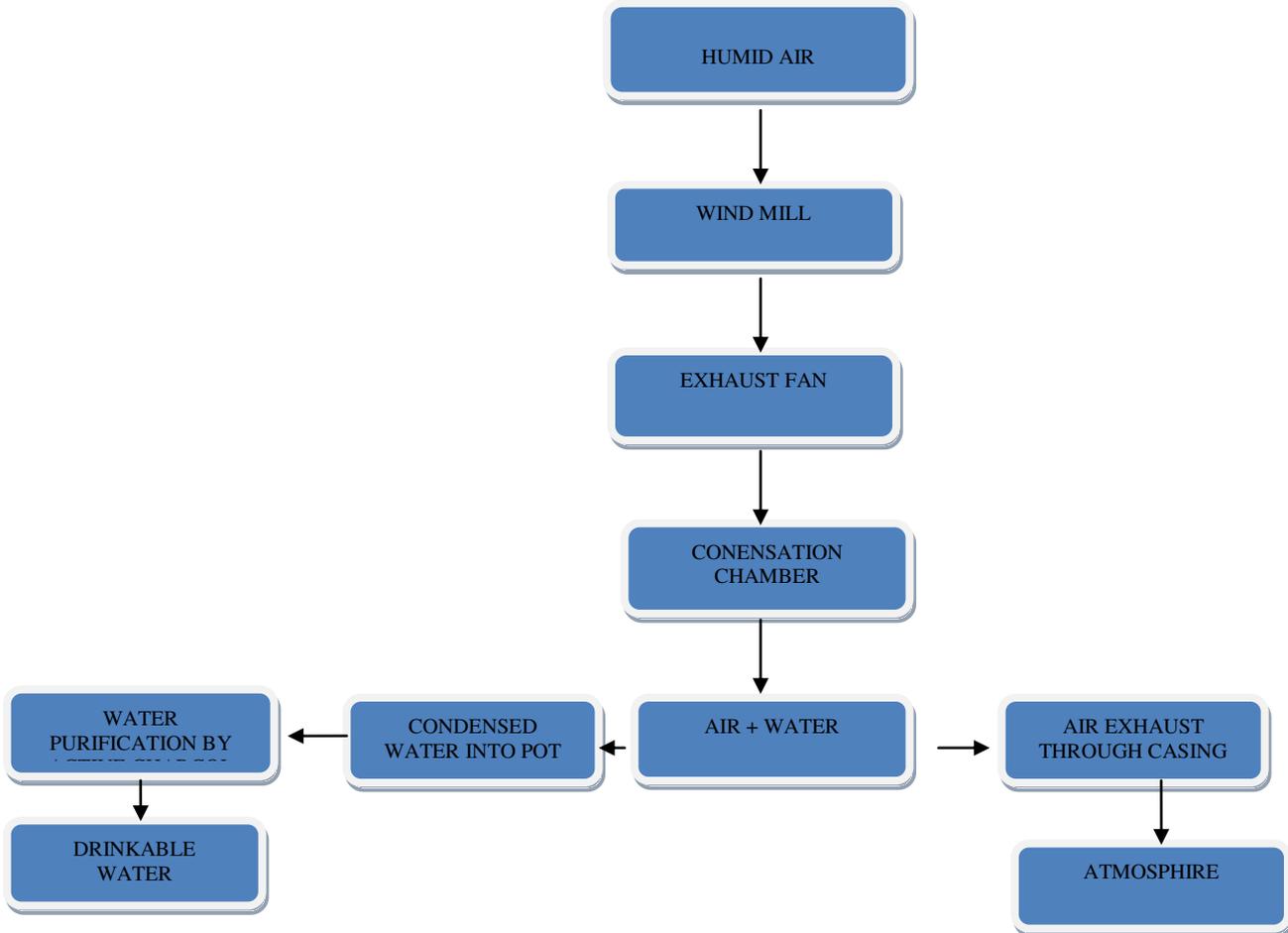


Fig 11. Flow Chart of AWG

IV.OBSERVATIONS

As we are not living the area which have high humidity in the atmosphere although we have taken observations at nearby area of our institute as shown in table no. 5. From the table we found that the nearby lake because of air is more humid so we got more water as compared to other places.



Table No. 5

SR.	LOCATION	MATERIAL USED FOR CONDENSATION	HUMIDITY IN AIR	WATER GENERATED (ml)
1.	Udaipur(GITS)	Iron	30 (Tested in March 2022)	3ml
2.	Udaipur(Dabok)	Iron and Copper	34.6 (Tested in April 2022)	5-7ml
3.	Udaipur(Udai Sagar Lake)	Copper and Clay pot	44 (Tested in April 2022)	Above 15ml

V. CONCLUSION

Drinkable water scarcity is prominent issue in current scenario due to drastic rise in worldwide population. Utilization of atmospheric water harvesting is an effective method to fulfill the need of drinkable water for society. Our project is based on the principal of natural condensation to extract water from atmospheric humid air. This project is suitable for the coastal region and the area where the humidity in the air is high. It is based on the active system which do not require any external source of energy to extract water from humid air and we utilized the available resources in such a way to reduce the cost so that anyone can easily afford it.

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