AQUANEBULA SMART WATER DISPENSER

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Abstract: The Aqua Nebula Smart Water Dispenser is an innovative device that provides clean, safe drinking water using two eco-friendly sources: air and rain. It uses air-to-water technology to pull moisture from the air and turn it into water, while a rain sensor detects rainfall and collects rainwater automatically. This dual-source system ensures you always have water, even in dry areas or places with limited water access. The water is purified through multiple filters to remove dirt, bacteria, and harmful substances, and make it safe to drink. The system also adds minerals to improve the taste and health benefits of the water. The rain sensor helps save water by collecting rainwater whenever it rains, reducing the need for other water sources. This makes AquaNebula not only convenient but also environmentally friendly. Its modern design fits well in homes, offices, or communities, and it uses energy efficiently to minimize its impact on the environment. Whether you live in a city or a rural area, AquaNebula is a smart, sustainable solution for clean water. By using air and rain, it ensures you always have access to safe drinking water while helping to protect the planet. AquaNebula is a step toward solving water scarcity and building a greener future for everyone.

Keywords: Air-to-water Generator, Smart water dispenser, Rain sensor.

I. INTRODUCTION

The AquaNebula Smart Water Dispenser is a revolutionary device designed to provide clean, safe drinking water in a smart and sustainable way. It uses advanced air-to-water technology to pull moisture from the air and turn it into water, ensuring you always have a reliable source of drinking water, even in dry or remote areas. But that's not all AquaNebula also features a rain sensor that detects rainfall and automatically collects rainwater, which is then filtered and stored for later use. This dual-source system makes it a perfect solution for areas with limited access to traditional water supplies. The water generated by AquaNebula goes through a multi-stage purification process, including sediment filtration, activated carbon filtration, to remove impurities and make it safe to drink. It also adds essential minerals to improve the taste and health benefits of the water. The rain sensor not only helps collect rainwater efficiently but also reduces the need for external water sources, making AquaNebula an eco-friendly choice. Its sleek, modern design fits perfectly in homes, offices, or communities, and it operates in an energy-efficient way to minimize its environmental impact. Whether you live in a city or a rural area, AquaNebula is a smart, sustainable solution for clean water. By using air and rain, it ensures you always have access to safe drinking water while helping to protect the planet. AquaNebula is more than just a water dispenser it's a step toward solving water scarcity and building a greener future for everyone.

1.1 MOTIVATION
The motivation behind the Air-to-Water Generator Smart Water Dispenser and rainwater harvesting stems from the urgent need to address global water scarcity and provide a sustainable, eco-friendly solution. With growing environmental concerns and limited access to clean drinking water in many regions, innovative technologies are essential. This dispenser not only reduces reliance on depleting natural water sources but also minimizes plastic waste, promoting a greener future. Its ability to provide safe, potable water anytime, anywhere inspires the adoption of sustainable living practices.

1.2 OBJECTIVES
The main goal of this work is to generate clean drinking water directly from atmospheric humidity, reducing dependence on traditional water sources. To ensure water purity utilizes advanced filtration and mineralization processes to deliver safe, high-quality drinking water. To promote eco-friendliness, minimize environmental impact by reducing plastic waste from bottled water and conserving natural resources. To provide an economical alternative to bottled water and traditional water supply systems over time. To Offer a reliable water solution for disaster relief operations and areas with limited infrastructure.

II. METHODOLOGY

The Aquanebula Smart Water dispenser involves a structured methodology starting with a needs assessment and planning phase, where community engagement and site selection are crucial to understanding local water needs and determining optimal locations for the units. It takes a methodical strategy to design a air to water dispenser system for an embedded system.
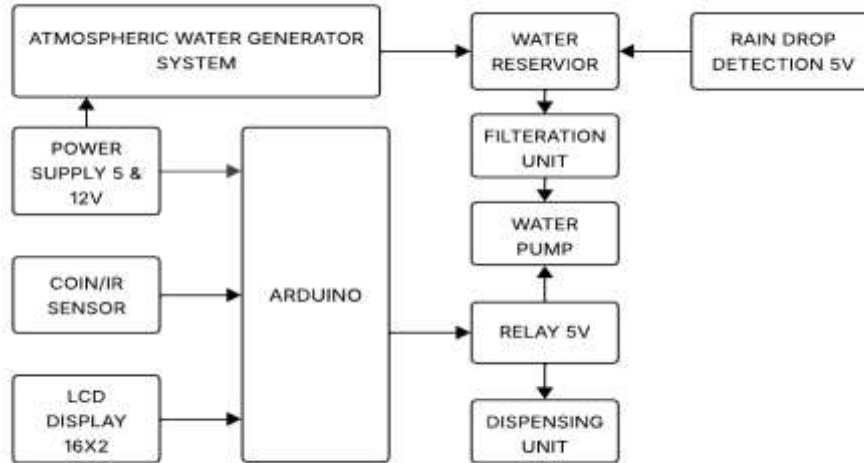

Fig.:1 Block diagram of Aquanebula Smart Water Dispenser

Atmospheric Water Generator System: Draws air from the atmosphere into the device using fans or blowers. Filters the incoming air to remove dust and impurities. Cools the air to its dew point. This causes water vapor in the air to condense into liquid water.

Rainwater Storage: A rain drop detector to sense rainfall and trigger an automatic valve. Direct the collected water into a storage tank for later use, activating the system only when rain is detected.

Water Collection Filtration unit: Collects the condensed water and rainwater in a storage tank. Atmospheric Water Generator systems use gravity or a pump to transfer water to this reservoir. Filters the collected water through multiple stages to remove any remaining impurities. Often includes disinfection methods to ensure the water is safe to drink.

Storage: Stores the purified water in a tank, keeping it at a safe, drinkable temperature. Dispenses water on demand through a integrated pump system.

Coin Detection and Dispensing: The IR sensor detects the insertion of a coin and sends a signal to the Arduino. Upon receiving the signal from the IR sensor, the Arduino activates the DC motor, which dispenses an empty cup glass.

User Interaction: The system provides indicators (e.g., LEDs or an LCD screen) to inform users about the status of the operation (e.g., "Insert Coin," "Dispensing cup," "Refilling cup," "Operation Complete").

III. IMPLEMENTATION

Implementing an AquaNebula system, which is an air-to-water generator with rainwater detection, collection, and coin-operated dispensing, involves several steps. Below is a detailed implementation plan, including the necessary components and flowchart.

Start: The process begins with the system activation. This could involve powering on the system and initializing all components, such as sensors, the cooling unit, and the filtration system.

Air Intake and Rainwater Collection: The system draws in ambient air, which contains moisture. This is typically done using a fan or blower. In addition to extracting moisture from the air, the system can also collect rainwater. This involves directing rainwater into a collection system, often using gutters or channels.

Cooling and Condensation Process: The collected air is passed through a cooling system, often involving a condenser or cooling coils. As the air cools, the moisture condenses into water droplets. This process mimics the natural formation of dew and is crucial for extracting water from humid air.

Water Storage and Filtration: The condensed water is collected in a water tank. This tank serves as a temporary storage unit before the water undergoes further processing. The collected water is passed through a filtration unit to remove impurities, contaminants, and any particulates.

Dispensing Unit: The filtered water is sent to a dispensing unit, which controls the release of water to the user. This unit may include a pump to move water from the storage tank to the dispensing point and a valve to control the flow.
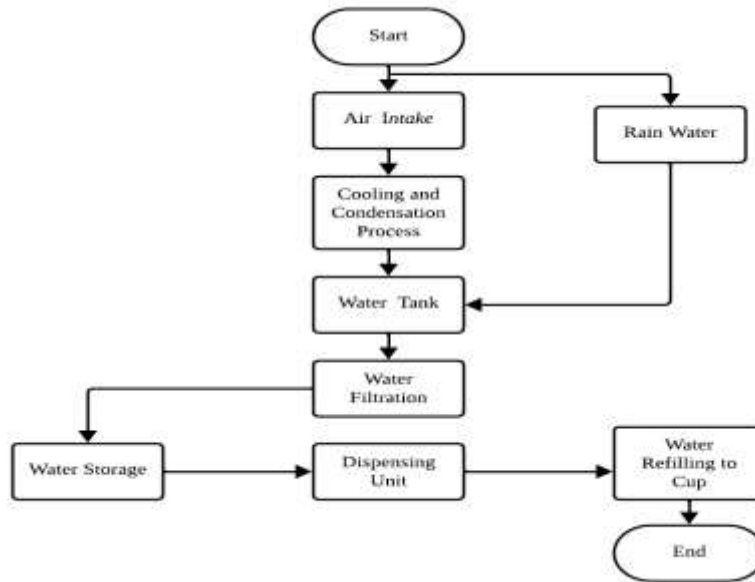

Fig.:2 Flow Chart

IV. RESULT

This project successfully demonstrates the development of a Aquanebula smart water dispensing, Rain water storage and Dispensing system using Arduino. The system automates the entire process, making it user-friendly and efficient. It provides a practical solution for public places, ensuring easy access to clean water and promoting the use of glass (cup). The project highlights the potential of Arduino in automating everyday tasks and addresses both convenience and environmental sustainability.

The below fig 2 shows the model of Aquanebula smart water dispenser

Fig.:3 AQUANEBULA SMART WATER DISPENSER

STEP1: Air from the atmosphere into the device using fans. Filters the incoming air to remove dust, impurities and causing the moisture to condense into water droplets. Collects the condensed water in a storage tank

Fig.:4 Air to Water Generator System

STEP2: A rain drop detector to sense rainfall and trigger an automatic valve. Direct the collected water into a storage tank for later use, activating the system only when rain is detected.

Fig.:5 Collecting the Rain Water Storage Tank System

STEP3: The condensed water and rainwater go through a filtration system. The both water sources makes a multi-stage filtration before storing for use.

Fig.:6 Filtration System

STEP4: The Coin Detection of IR sensor detects the insertion of a coin and sends a signal to the Arduino and the LCD displays corresponding information.

Fig.:6 Smart Dispenser Display the Coin Detection

STEP5: Cup Dispensed upon receiving the signal from the IR sensor, the Arduino activates the DC motor, which dispenses an empty Cup, Water refilling after dispensing the cup, the Arduino activates the water pump to fill the cup with water.
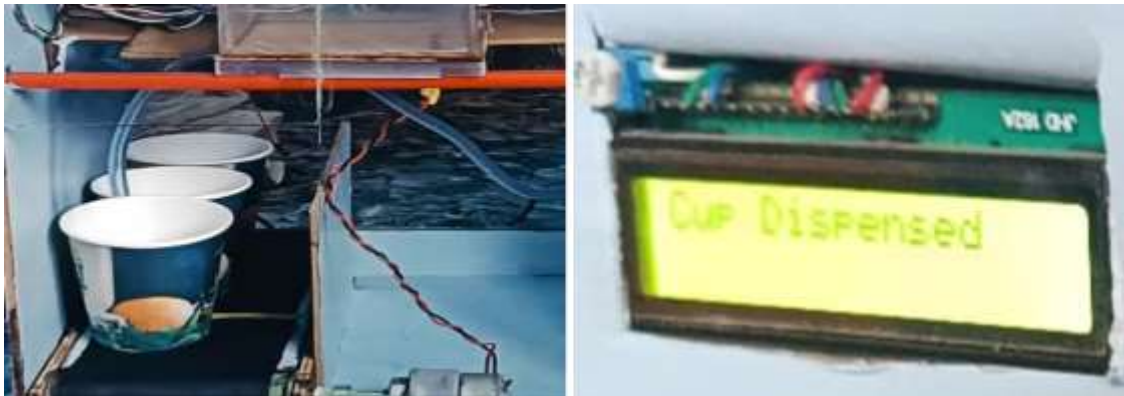

Fig.:7 Cup Dispensed and fill with water

V. CONCLUSION

The AquaNebula Smart Water Dispenser is a game-changing solution for clean, safe, and sustainable water access. By combining air-to-water technology with rainwater harvesting, it ensures a reliable water supply, even in areas facing water scarcity. The system extracts moisture from the air and collects rainwater using a smart rain sensor, providing a dual-source solution that's both efficient and eco-friendly. With advanced filtration, AquaNebula delivers water that's not only safe to drink but also enriched with essential minerals for better taste and health. The rain sensor maximizes water collection during rainy seasons, reducing reliance on external water sources and promoting sustainability. Designed for homes, offices, and communities, AquaNebula is a modern, energy-efficient device that fits seamlessly into any environment. It's more than just a water dispenser it's a step toward solving global water challenges and protecting the planet. By harnessing the power of air and rain, AquaNebula ensures access to clean water anytime, anywhere, making it a vital tool for a greener, healthier future. Choose AquaNebula for a smarter, sustainable way to stay hydrated.

FUTURE SCOPE

 The future scope of the Aquanebula Smart Water Dispenser, combined with rainwater storage and dispensing units, offers a promising sustainable solution. As water scarcity becomes a global concern, integrating smart dispensers with rainwater harvesting systems can provide an eco-friendly, efficient way to manage water usage. Advanced sensors and AI could optimize water usage, monitor quality, and predict maintenance needs, making the system even more automated. With increasing focus on sustainability, such systems could not only reduce dependence on municipal water sources but also help in promoting conservation, offering a smarter, greener alternative for homes and businesses alike.

REFERENCES

[1]. Chartres, C. and Varma, S. "Out of water. From abundance to Scarcity and How to Solve the World's Water problems" FT Press (USA), 2010.

[2]. W. Frank Domoney, Naseem Ramli, Salma Alarefi, Stuart D. Walker, "Smart city solutions to water management using self-powered, low cost, water sensors and Apache spark data aggregation", IEEE 3rd International Renewable and sustainable energy Conference (IRSEC), 2015.

[3]. P. B. Anand "Scarcity, Entitlements and the Economics of Water in Developing Countries: Sharing Water Peacefully", in 2008, Edward Elgar Publishing.

[4]. Anbarasu T., Pavithra S. "Vapour Compression Refrigeration System Generating Fresh Water from Humidity in the Air", 2011.

[5]. Ekad, A, Pawar, T., Yeole, N., Taksale, A., & Gajjar, A. (2016). Peltier-seebeck thermoelectric element thermoelectriccooler. Energies, 4, 1-17..

[6]. Joshi, V.P., Joshi, V.S., Kothari, H.A., Mahajan, M.D., Chaudhari, M.B. and Sant, K.D., 2017. Experimental investigations on a portable fresh water generator using a thermoelectric cooler. Energy Procedia, 109, pp.161-166 Thermal Science Engineering Progress, 6, 14-26.

[7]. Lucia Cattani, Anna Magrini, Paolo in the year 2021 about Water Extraction from Air: A Proposal for a New Indicator to Compare Air Water Generators Efficiency.

[8]. Arunkumar S M, Aston Titus. "Design and Fabrication of Atmospheric Water Generator" International Journal of Scientific Research and Engineering Development–- Vol 4(1), 2021.

[9]. Gangadhara, Hitha S Chowta, Naeema Thasneem, Savi S Chowta, Veekshitha. "Aquanebula: air to water generator" IJRAR, Vol 1(3), 2024.

[10]. Bhusani Navyasri, Bodla Unnathsai, Kunde Tejasri, Mallipeddi sindhupriya, Buddula Jamuna. "Water ATM with Bottle Dispenser" IJIRT ,Volume 9 Issue 11, 2023.