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International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design of Water Purification Setup by Using Manually Operated Machine

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ABSTRACT-

This paper focuses on the design of a Manually operated water purification system which can be used in rural and flood affected areas for the purification of water at small scale. It works on the principle of to remove impurities from water to make it safe for drinking by using mechanism of conversion of mechanical energy into electrical energy by using Dynamo. The design consists of a water pump, filter, trolly, Belt conveyor, Batteries and Storage Tank. This setup is made in such a way that it can be detached while carrying from one place to another place.

I. INTRODUCTION

Water purification process of removing dirt, dust ,bacteria and odour from water to make it drinkable and Usable for daily needs. In developed countries like UK ,USA and Europe region have easy access to clean water. But in underdeveloped and developing countries there is lack of drinkable water. In rural and flood affected areas there is no access to electricity , also conventional water treatment processes are not that much effective. This leads to diseases like cholera, diarrhoea, dysentery, hepatitis A, typhoid. The objective of this system is to get clean water with the help of purification system which is run by manually powered mechanism.

II. Literature Review

Water scarcity affects nearly one billion people in the developing world. Inadequate access to clean water sources, particularly for women and girls, contributes to health risks and hinders social and economic development. Addressing the water crisis is crucial for improving education, reducing hunger, promoting good health, and alleviating poverty in these regions.

The Cycloclean - developed by Nippon Basic Co, Ltd., is a crank-powered water filtration system designed for emergency use. It was created in response to major earthquakes in Japan, such as the Hanshin Earthquake in 1995 and the Chuetsu Earthquake in 2004. The system consists of a purifying case attached to the rear seat of a bicycle, enabling easy transportation to areas inaccessible by traditional means. The Cycloclean is capable of purifying water from various sources, including ponds, rivers, lakes, bathtubs, and pools. Its powerful design allows it to siphon water from depths of up to five meters. The purification system comprises three filters, a pressure pump, two water hoses, and a manual fitting, ensuring the production of 5 liters of clean water per minute. The Cycloclean offers a portable and efficient solution for emergency water purification, providing clean drinking water in disaster-stricken areas where access to safe water sources is limited.

Aquaduct - Pedal-Powered Water Filtration and Storage Vehicle. The Aquaduct is a pedal-powered vehicle that filters and transports water simultaneously. It was developed by a group of designers from IDEO for the Innovate or Die contest in 2008. The vehicle allows the user to pedal, which activates a pump to draw water from a holding tank. The water is then filtered through a carbon filter and stored in a clean tank. The Aquaduct's design enables users to filter water while on the move or stationary, providing a portable solution for accessing clean water in various settings.

III. Objective

Conduct an extensive review of relevant literature to gain insights into existing manually operated water purification systems, examining their design principles, efficiency, and limitations. Analyze the factors contributing to the weight of the system and explore innovative design strategies and lightweight materials to reduce overall weight without compromising functionality and effectiveness. Assess the economic viability of the system by considering the cost of materials, manufacturing processes, and maintenance requirements, identifying opportunities to optimize the design for cost-effectiveness. Investigate the feasibility of integrating a battery-powered mechanism into the system to enhance operation and provide convenience in areas with limited or unreliable manual power sources.Evaluate the maintenance requirements of the system and propose measures to minimize

maintenance costs, such as utilizing durable components, implementing user-friendly maintenance procedures, and exploring self-cleaning or self-maintenance mechanisms. Prototype and test the designed system, considering weight reduction, economic affordability, battery-powered operation, and low maintenance costs, and evaluate its performance in purifying water from various sources..

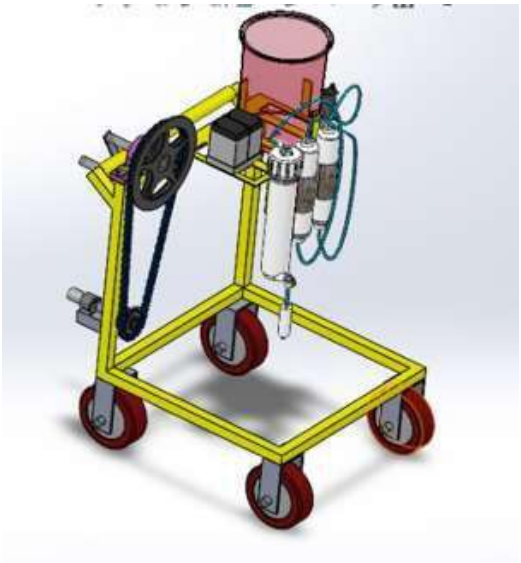
IV. Working

In this Setup the mechanical energy is converted into electrical energy by using dynamo which is mounted to the frame. Thus, the power is transmitted to the batteries from dynamo. The Electricity stored in the batteries is later used to run the water pump and RO purifier. Water purifier consists of

- Sediment filter which removes large particles and sediment from the water, such as sand and dirt.
- Carbon filter: The carbon filter removes chlorine, organic compounds, and other chemicals that can affect the taste and odour of water.

C)Reverse osmosis (RO) membrane: This membrane removes dissolved minerals, heavy metals, and other impurities in the water.

IV. Proposed Methodology



V.CONCLUSION

In conclusion, this research paper successfully addressed the objectives of designing a manually operated water purification system. The focus on reducing system weight, ensuring economic affordability, exploring battery-powered operation, and minimizing maintenance costs has yielded positive outcomes. By integrating lightweight materials, cost-effective components, battery-powered mechanisms, and user-friendly maintenance procedures, an efficient and accessible water purification system has been developed. This research significantly contributes to meeting the urgent demand for portable, affordable, and sustainable solutions for clean water access, particularly in resource-constrained areas.

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