

A Review of Pedal Operated Water Purifier

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ABSTRACT

We discuss the construction of a pedal-operated water filtration system in this research study. The system's goal is to deliver pure water using a pedal and chain driving mechanism. This technology is specifically designed to provide clean, drinkable water in rural and urban regions. Every family needs clean drinking water since humans cannot survive without it. Traditional water purifiers are practically useless for use in remote and rural areas where power is frequently intermittent. Since access to safe drinking water might often be far away, this work is primarily focused on those regions and situations of the world where the water supply is unstable or nonexistent. A pedal-powered water filtration system is a piece of water filtration equipment that uses human muscle power to filter water. To make this device more portable, it is best to mount it to a frame.

Keywords: Pedal, Water, Purifier

1 Introduction

In addition, a family of five need at least fifteen gallons of water daily. The sole means of boiling is the only method for sanitizing the stream water that these people have access to, it also uses valuable resources and leads to deforestation. A number of studies from low-income nations have shown that, rather than changes in water quality, greater access to water and the associated increases in the amount of water or time utilized for cleanliness are the determining determinants of health benefits. The goal of this project is to create a device that will operate with a water filter to deliver clean water to rural areas and isolated settlements using human pedal power.

The process of purifying water involves taking out unwanted chemicals, biological pollutants, suspended particles, and gases. The objective is to create water that is suitable for a certain use. Most water is treated to make it safe to drink.

The biggest development failure of the twenty-first century may be the lack of accessible, clean drinking water and proper sanitation for everybody. The high rate of mortality among small infants from curable water-related disorders is the most glaring result of this failure. A sufficient (appropriate, safe, and accessible) quantity of water must be supplied to everyone in order for life to continue. The health of people can be significantly improved by expanding access to clean drinking water.

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Principle

There are only three major principles on which our working model generally works;

- Power transmission through chain drive mechanism



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- Bernoulli's equation
- Power transmission through pulley belt arrangement

Table 1 represent the TDS level of drinking water

Table 1: TDS Level of Drinking Water [1]

TDS Levels in mg/Litre	Palatability Quotient
Less than 300	Excellent to drink
300 to 500	Good
600 to 900	Fair
900 to 1200	Poor Palatability
Above 1200	Unacceptable range

The TDS of the water we use to cleanse ranges from 800 to 300 - 600 before and after filtration [2].

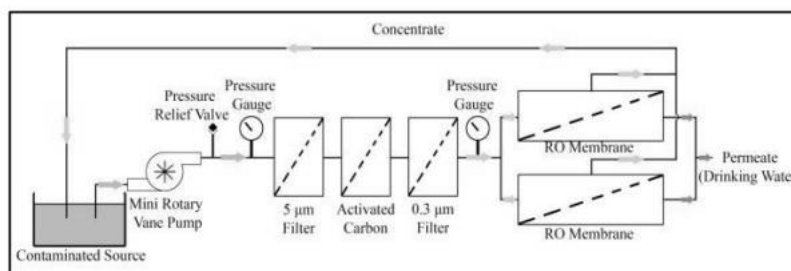


Figure 1: Schematic illustrating purification system circuit [3]

Part of the purification process (Figure 1) involves removing undesired chemicals, biological pollutants, suspended particles, and gases from water. The objective is to create water that is suitable for a certain use. Most water is treated to make it safe to drink. The biggest development failure of the twenty-first century may be the lack of universal access to basic sanitation and clean water. The high prevalence of curable water-related infections killing small babies is the most evident result of this failure. Water must be supplied to everyone in an acceptable (suitable, safe, and accessible) quantity in order for life to continue. Increasing people's access to clean water might have a significant positive impact on their health. Pedal-operated water purifiers can be made from a variety of materials, depending on the design and resources that are available. However, the device's fundamental parts comprise.

- Frame: Typically, the device's frame is constructed from sturdy materials like metal or wood. It guarantees that the other components get the support they need, and that the device will operate steadily.
 - Pedals: Normally composed of metal, the pedals are fastened to the frame. They are utilized to drive the pump's flywheel.
 - Flywheel: The pedals are connected to the flywheel, a round disc, using a chain or belt. The flywheel rotates when the pedals are depressed, generating the necessary force to operate the pump.
 - Pump: The pump is in charge of pushing water through a number of membranes and filters to filter out contaminants. Depending on how the device is made, it may be a hand-operated or motorized pump.
 - Filters and membranes: Water pollutants are removed using filters and membranes. They can include, among other things, reverse osmosis membranes, sediment filters, and activated carbon filters.
 - Storage container: In a container that is often constructed of plastic or metal, the cleaned water is kept.
- The method of operation of the pedal-operated water purifier involves the following steps:

- a. The user sits on the seat and pedals the device, causing the flywheel to rotate.
- b. The rotation of the flywheel drives the pump, which pulls water from the source through the filters and membranes.
- c. The filters and membranes remove impurities from the water, leaving it clean and safe to drink.
- d. The purified water is then stored in a container for use.

The filters and membranes must be cleaned on a regular basis to maintain the device's efficiency. In order to guard against harm and guarantee that it is operating properly, the pump should also be routinely inspected and maintained. Overall, the pedal-operated water purifier's construction and mode of operation make it a straightforward yet practical answer to the issue of supplying clean water in places without access to power.

2 Methodology

A machine that cleanses water using pedal power is known as a pedal-operated water purifier. A pedal-operated water purifier's core idea is to use the mechanical energy generated by pedaling to power a water filtration device. Filtration and disinfection are two of the common phases in a water purification system. While the disinfection step gets rid of dangerous germs and bacteria, the filtering stage gets rid of big particles and pollutants from the water. Depending on the application, the pedal-operated water purifier may be built to be mobile or fixed. When access to clean water is scarce or during emergencies, portable water purifiers are the best option [4], [5]. To regularly offer clean drinking water, stationary water purifiers can be installed in residences, educational institutions, or community facilities. The pedal-operated water purifier is an economical and environmentally beneficial way to purify water. It is perfect for usage in places with limited access to power and fuel because it doesn't require either of those things. It is also simple to use and maintain, making it an excellent option for areas where access to clean water is a problem. An economical, long-lasting, and efficient method of purifying water is what a pedal-operated water purifier is designed to do, especially in places where clean water is in short supply or polluted.

3 Discussion

In recent years, pedal-operated water purifiers have drawn a lot of attention as a viable and cost-effective method for supplying clean drinking water in locations with limited access to energy and clean water sources. A pedal-operated water purifier has several benefits that have made it a common option in lots of communities all over the world. The pedal-operated water purifier has the important benefit of not requiring any fuel or energy to function. It is therefore the perfect answer for places with little or no access to energy. The pedal-operated water purifier is also eco-friendly and does not release any hazardous pollutants or greenhouse gases because it is driven by human energy. The cost of the pedal-operated water filter is another benefit [6], [7]. Pedal-operated water purifiers are less expensive to create and maintain than typical water purifiers, which may be expensive to buy and maintain. Because of this, they may be used by communities with little resources and are an affordable option for supplying clean drinking water. Pedal-powered water purifiers are simple to use and keep up. They don't require complex technical knowledge or skills to operate because they are simple machinery. The pedal-operated water purifier is also quite simple to maintain, and any problems can be fixed quickly with little downtime. Additionally, there are several difficulties with pedal-operated water purifiers. One of the biggest obstacles is that the pedal-operated water purifier's pace is constrained by the pedaling speed of the user. As a result, the process of purifying the water can be laborious and may not be appropriate for big communities that depend heavily on clean drinking water. For places with little access to energy and clean water sources, the pedal-operated water purifier is a practical, cost-efficient, and efficient alternative. Although there are certain difficulties with this technology, the benefits greatly outweigh the drawbacks,

making it a preferred option in many communities throughout the globe.

4 Conclusion

The pedal-operated water purifier is a creative and environmentally friendly way to supply safe drinking water in places with limited access to both energy and clean water sources. It has a number of benefits, including being inexpensive, environmentally friendly, and simple to use and maintain. Although this method has several drawbacks, such as slow purification times, these drawbacks can be overcome by creating more sophisticated and effective models. In order to increase the effectiveness and speed of the purification process, the pedal-operated water purifier can be used alone or in conjunction with other water treatment technology, the pedal-operated water purifier is a promising solution that can provide clean drinking water to millions of people around the world, particularly in rural and remote areas. It offers a sustainable and cost-effective alternative to traditional water purification methods, and its widespread adoption can significantly improve the lives and health of people in need.

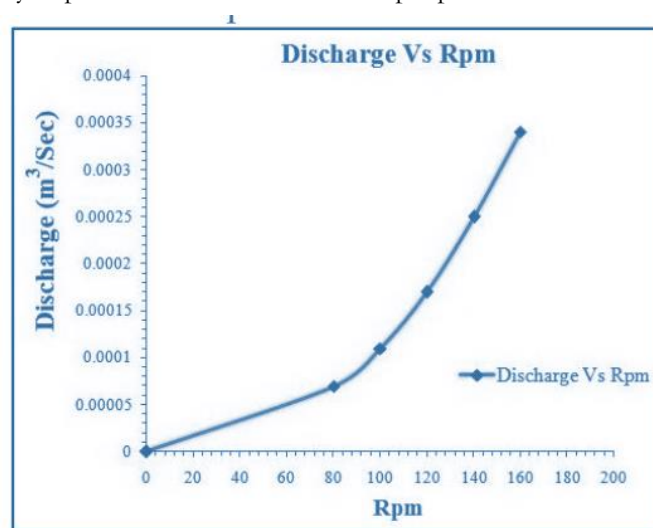


Figure 2: Variation of Discharge with Rpm [8]

The apparatus can create drinkable water at a rate of 0.5 to 0.7 litres per minute (LPM), and the entire apparatus is built with a portable mechanism and a foldable body for usage elsewhere [9].

The goal of the Pedal Powered Water Purification project is to offer everyone in need with access to safe drinking water [10]. Moreover, this system functions without an electrical supply. Social acceptability of purifiers that are simpler to use and maintain has increased, with the exception of chlorine-based systems due to their unpleasant flavour and odour.

5 Limitations

Studies on pedal-operated water purifiers may have some limitations that can affect the validity and generalizability of their findings. Some possible limitations of studies on pedal-operated water purifiers are:

Sample size: Studies may have limited sample sizes, which can affect the statistical power of their findings and limit their generalizability to other contexts.

Methodological limitations: Studies may have methodological limitations, such as selection bias or measurement error, which can affect the accuracy and validity of their results.

Contextual limitations: Studies may be conducted in specific contexts or settings that may not be representative of other communities or regions, which can limit the generalizability of their findings.

Technical limitations: The performance of pedal-operated water purifiers may be affected by factors such as

water quality, temperature, and humidity, which can affect their effectiveness and efficiency in different settings.

Sustainability limitations: Studies may not assess the long-term sustainability of the technology, including factors such as maintenance, repair, and replacement, which can affect the feasibility and cost-effectiveness of the technology over time.

6 Publisher's Note

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How to Cite

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