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Pedal-Powered Water Purifier

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ABSTRACT
This paper focuses on the fabrication of a pedal-powered system. By rotation of impeller with muscle power using gear mechanism leads to extract pure water from impure water. It consists of a rotary pump, gears, Dc motor and sprayer pump. By revolving the handle the gears get rotated and the dc motor generates electricity which will be stored in a battery and goes to the spray pump. Simultaneously the water will also get lifted while revolving the handle and the water sends to the water purifier. It mostly suits in remote and rural areas. This assembly is compact, easily transportable.

***Keywords**: Rotary pump, filters, DC rotor, gears, water*

INTRODUCTION

Access to clean drinking water is essential for human survival and good health, yet many people around the world still lack access to safe and reliable sources of clean water. In many areas, especially in rural or remote regions, electricity is scarce and water purification systems can be expensive and difficult to maintain.

Pedal-powered water purifiers are an innovative solution to this problem, offering a low-cost, sustainable, and portable method for purifying water using human power. By revolving the handle the water is pumped through rotary pump and sent to filters to remove harmful contaminants, producing clean drinking water.

Pedal-powered water purifiers offer a promising solution for improving access to clean water in areas where traditional methods may not be feasible or practical. Pedal-powered water purifiers are gaining popularity as a solution to the water crisis that affects many areas around the world. In addition to being cost-effective and sustainable, these devices are also highly portable, making them suitable for use in remote or rural regions where access to clean water is limited.

The process of purifying water using a pedal-powered system is simple and effective. The device consists of a gear mechanism, frame that is attached to a water pump. The user revolves the handle which in turn powers the water pump, forcing water through a series of filters that remove impurities, contaminants and produces clean drinking water.

One of the major advantages of pedal-powered water purifiers is their low cost. They are significantly cheaper than traditional water purification systems and can be built using locally available materials, making them accessible to even the poorest communities. In addition, they require minimal maintenance and can be easily repaired if necessary. Overall, pedal-powered water purifiers offer a promising solution for improving access to

clean water in areas where traditional methods may not be feasible or practical. With their low cost, sustainability, and portability, these devices have the potential to transform the lives of millions of people around the world who currently lack access to safe and reliable sources of drinking water.

LITERATURE SURVEY

Here are some literature surveys on pedal-powered water purifiers:

[1]"Design and Fabrication of a Pedal Operated Water Purifier for Rural Areas" by K. Niranjan and V. Hemanth Kumar. This study discusses the design and fabrication of a pedal-operated water purifier that can be used in rural areas. The system uses a multi-stage filtration process to purify water and is powered by a pedal-operated mechanism. The study concludes that the system is effective in purifying water and can be a viable solution for rural areas.[2]"Pedal Operated Water Purification System" by K. Nataraj and M. Rajkumar.

This study presents a pedal-operated water purification system that uses a gravity-fed filtration process. The system is designed to be low cost and easy to operate, making it suitable for use in rural areas. The study concludes that the system is effective in purifying water and can be a useful solution for communities without access to clean drinking water.[3]"Development of a Pedal Operated Water Purifier for Rural Areas" by S. S. Dubey and S. S. Thakur.

This study discusses the development of a pedal-operated water purifier that uses a combination of filtration and ultraviolet sterilization to purify water. The system is designed to be low cost and easy to operate, making it suitable for use in rural areas. The study concludes that the system is effective in purifying water and can be a useful solution for communities without access to clean drinking water.[4]"Pedal Operated Water Purification System for Rural Areas" by B. S.

Karthikeyan and R. Karthikeyan. This study presents a pedal-operated water purification system that uses a combination of sedimentation, filtration, and disinfection to purify water. The system is designed to be low-cost and easy to operate, making it suitable for use in rural areas. The study concludes that the system is effective in purifying water and can be a useful solution for communities without access to clean drinking water.

Overall, these literature surveys suggest that pedal-powered water purifiers can be an effective and low-cost solution for communities without access to clean drinking water, particularly in rural areas or in disaster management scenarios.

EXPERIMENTAL WORK

Design and Fabrication

A Pedal-powered water purifier system that uses Human power to operate a water purification unit. The steps involved in our project pedal-powered water purifier are as follows:

The design and fabrication of the pedal-powered system here first a rotary pump is connected to the water filters using pipes with help of a supporting frame and while revolving the handle the impure water gets lifted due to pressure created in the rotary pump and transfers to the water filter. Here the dc rotor is fixed on the rotary pump to generate electricity while revolving the handle. The Final assembly of pedal powered system is shown in Fig. 1

Fig. 1: *Final assembly of pedal powered system.*

Water Filtration Unit [Fig. 2]

The water filtration unit typically consists of four stages including of

- 1st step of pre-filtering is to trap large particles and debris from the fluid before entering the main filter system. The pre-filter bowl is usually located near the point of entry of the fluid and it sends to the second stage of filtration.
- 2nd step is Sediment filtration this is used for the removal of sand, oil, dirt, and rust particles. This process is particularly effective at removing sand, silt, rust, and debris that can cause damage to plumbing fixtures and appliances, or affect the taste and clarity of the water.
- 3rd step is Pre carbon filtration by absorbing or eliminating any remaining chlorine and organic chemicals from the water.
- 4th step post-carbon filtration is the final stage of purification where this filter gets rid of the unpleasant smell from the water and enhances the water's flavour.[5-8]

Fig. 2: *Water filtration unit along with frame.*

Power Transmission [Fig. 3]

Here as we revolve the handle of the rotary pump the dc motor also gets rotated. It rotates the motor in a reverse direction resulting in changing magnetic field from the rotation causing an alternating current and storing the electricity in a Battery

The electricity stored in the battery will be used by the spray nozzle pump where the nozzle pump will increase the pressure of the water flow sent to the filters. The semi-permeable membrane in the pre-carbon filter requires more pressure of water flow to increase the purity level of the water so it uses the electricity generated from the dc motor

(a)

(b)

Fig. 3: *(a) Spray nozzle pump, (b) Dc motor.*

SPECIFICATIONS OF PARTS [Table 1]

Table 1: *Theoretical fixed values.*

The pressure of the pump	10.34 bar
Teeth of the large gear	65
Teeth of the small gear	34
Gear ratio	1.9
Dc motor	500 rpm
Battery voltage	12v
Water filter discharge	200ml/min
spray Pump flow	4lpm

CONCLUSION

These systems typically work by using a pedal-powered mechanism to drive a pump or filtration system. The pedal power can be generated by a single individual or a group of individuals working together. The water is then purified through a variety of methods, such as filtration, and made safe for drinking.

The benefits of pedal-powered water purifier systems include their ability to operate in remote areas, their low cost, and their environmental friendliness. Their effectiveness will depend on the quality and design of the specific system being used, as well as the quality of the water source treated. Overall pedal -powered water purifier systems have the potential to provide clean drinking water to communities in need and can be a valuable tool for improving public health and access to clean water.

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