

# A REVIEW PAPER ON TRICYCLE POWERED WATER FILTRATION SYSTEM

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## ABSTRACT

*We are addressing the need for clean water access in rural areas through the use of a tricycle as a means of transportation and water filtration. Bicycling is a great way to burn calories and get fit. But a new kind of bike may improve the health of entire communities in an entirely different way. This project is used to scale up production of a bicycle that purifies water for those living in remote villages or disaster areas. The Tricycle functions just like any other bicycle, except that the addition of a water filtering system allows driver to crank out drinking water using the same pedalling motion that propels the tricycle forward. The rotation of the bicycle chain helps to remove impurities by driving a single acting reciprocating pump that pumps water through a system of filters, and hoses located near the filtration system*

## I. Introduction

Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from contaminated water. The goal of this process is to produce water fit for a specific purpose. Most water is disinfected for human consumption (drinking water) but water purification may also be designed for a variety of other purposes, including meeting the requirements of medical, pharmacological, chemical and industrial applications. In general the methods used include physical processes such as filtration, sedimentation, and distillation, biological processes such as slow sand filters or biologically active carbon, chemical processes such as flocculation and chlorination and the use of electromagnetic radiation such as ultraviolet light.

According to a 2007 World Health Organization report, 1.1 billion people lack access to an improved drinking water supply, 88 percent of the 4 billion annual cases of diarrheal disease are attributed to unsafe water

and inadequate sanitation and hygiene, and 1.8 million people die from diarrheal diseases each year. The WHO estimates that 94 percent of these diarrheal cases are preventable through modifications to the environment, including access to safe water.

Bicycling is a great way to burn calories and get fit. But a new kind of bike may improve the health of entire communities in an entirely different way. This project is used to scale up production of a bicycle that purifies water for those living in remote villages or disaster areas. The Tricycle functions just like any other bicycle, except that the addition of a water filtering system allows driver to crank out drinking water using the same pedalling motion that propels the tricycle forward. The rotation of the bicycle chain helps to remove impurities by driving a single acting reciprocating pump that pumps water through a system of filters, and hoses located near the filtration system.

## II. Problem Identification

- Often the water sources are at distant places in some areas. Men/women have to travel almost 2 to 4 km for obtaining the water from such sources which is labourious and time consuming.
- Transporting water from one place to another with the help of motorcycles and trucks leads to air pollution.
- Sanitizing water at home by boiling in rural areas require wood as fuel which can lead to deforestation.

## III. Proposed Design

Due to the described positive and negatives of each design, we are still undecided on the exact model we will use. The design that provides the best overall benefit and versatility will consequently be the one we choose.



Fig. 1 Pictorial View of the Proposed Design

This design is composed of a reciprocating pump powered by paddling, a sediment filter and hose or flexible tube as shown in Fig. 1. The person sits on the seat and paddles, the pedal crank transfer the motion from the main shaft to the coupling through a pair of gears. The pedal operated reciprocating pump starts reciprocating which drags the water from the contaminated water tank to pump and then deliver to the sediment filter attached in between the two tanks. Filtered water is collected in second tank from where it is further used for drinking.

## IV. Bernoulli's Principle

In fluid dynamics, Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy. The Bernoulli Equation can be considered to be a statement of the conservation of energy principle appropriate for flowing fluids. The qualitative behavior that is usually labeled with the term "Bernoulli effect" is the lowering of fluid pressure in regions where the flow velocity is increased. This lowering of pressure in a constriction of a flow path may seem counterintuitive, but seems less so when you consider pressure to be energy density. In the high velocity flow through the constriction, kinetic energy must increase at the expense of pressure energy.

## V. Main components

- **Tricycle**

Tricycles were used by riders who did not feel comfortable on the high wheelers, such as women who wore long, flowing dresses. A tricycle, often abbreviated to trike, is a human-powered (or gravity-powered) three-wheeled vehicle. Some tricycles, such as cycle rickshaws (for passenger transport) and freight trikes, are used for commercial purposes, especially in the developing world, particularly Africa and Asia.

- **Reciprocating pump**

A reciprocating pump is a class of positive-displacement pumps which includes the piston pump, plunger pump and diaphragm pump. It is often used where a relatively small quantity of liquid is to be handled and where delivery pressure is quite large. In reciprocating pumps, the chamber in which the liquid is trapped, is a stationary cylinder that contains the piston or plunger.

Pump specification:-

Pressure range-1.5-8 kgf/cm<sup>2</sup>

Model no- MAL25X50

- **Sediment filter**

These filters remove suspended solids larger than a nominal 5-micron size.

Filter housing holds 2" length cartridge.

Cartridges are spun polypropylene material, rated at 1 micron

Flow rate 2.7 GPM (0.61 M<sup>3</sup>/HR)

- **Water tanks**

In our project there are two tanks. One is used for handling the water which is to be filtered and the second tank is used to handle filtered water coming out of the filter. The capacity of each tank is 10 liters. Both the tanks are mounted on the tricycle and are connected to each other with the help of pipes.

## VI. Literature Review

Literature view is carried out for what has been studied and what is being modified regarding the project and what the earlier work has done on the project

1. "Sanjay N. Havaldar, Altaf Somani, Anushka Pikle, Yash Siriah & Samiksha Patil; **International Journal of Current Engineering & Technology**, 02 March 2016 (E-ISSN 2277 – 4106).

This paper analyzes the design of a pedal operated water filtration system to be used by local dwellers. It works on the principle of compression and sudden release of a tube by creating negative pressure in the tube and this vacuum created draws water from the sump into the pump while rollers push the water through to the filter where adsorption takes place to purify the water.

2. "Vishal Garg, Neelesh Khandare, Gautam Yadav, **International Journal of Engineering & Technology (IJERT)**, 01 January 2013.

In this paper, design and construction of pedal operated water pump which is used in small irrigation and garden irrigation. The pedal operated pump can be constructed using local material and skill. A water system includes a Centrifugal pump operated by pedal power.

3. “Sanjay N.Havaldar, Altaf Somani, Anusha Pikle, Yash Siriah and Samiksha Patil” , **International Journal of Current Engineering and Technology ( IMPRESSCO )** , 4 March 2016.

This paper analyzes the design of a pedal operated water filtration system to be used by local dwellers. It works on the principle of compression and sudden release of a tube by creating negative pressure in the tube and this vacuum created draws water from the sump into the pump while rollers push the water through to the filter where adsorption takes place to purify the water. The design comprises of a peristaltic pump powered by pedaling, a filter and hose or flexible tube. As the operator sits on the seat and pedals, the pedal crank transfers the motion to the rotor thus the rollers and the tube is squeezed by the set of rollers to move the fluid.

## VII. Conclusion

Through extensive research we found cost effective parts that met our goal of building a portable filtration system that can be retrofitted to any standard tricycle and facilitate the transportation and filtration of water for the daily use of families in many rural areas. Each component was thoroughly tested in order to provide results for the best product possible at the most reasonable price. In the future we hope to be able to be a partner with one of the many non-profit organizations dedicated to provide clean water around the globe such as, The Water Project, Water.org and Charity Water and reach the millions of people in need of a product like ours.

Another advantage of the system is that it can also be used for other applications like irrigation, agricultural use and domestic water transportation. This can be done simply with some design modifications or by attaching extra equipments to the system.

## VIII. References

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