



## Review On Cycle Mounted Water Purifier

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### Abstract :

Pure, clean drinking water is a need of every household as humans can't live without it. Electricity at rural and remote areas is extremely erratic, thus making conventional water purifiers almost redundant for use. Thus, this project is specifically aimed at such areas and conditions of the world where water supply is erratic or non-existent and access to clean drinking water is sometimes at long distances. A pedal operated water filtration system is a water filtering apparatus which can filter water by using human muscle power via a pedal operated mechanism. This apparatus is preferably mounted on a supporting frame for increased portability. It will be specifically designed to perform three important functions: storing water, filtering it and transporting it to the final destination. the aim of this project is to solve purifying drinking water by creating a durable apparatus which is cheap to manufacture and to buy, which can last for a long time in rural conditions and which can be detachable so that it can be mounted on any frame. The system works on the sprocket chain system with power generator dynamo along with supporting frame interfaced with filters, container with integrated heating element and supporting circuit to achieve this

system development. The overall apparatus is designed to be as lightweight and as cheap as possible so as to make it easily accessible to a very wide range of people. The apparatus is also designed to be made detachable so that it can be easily shifted from one place to another with minimal modifications.

**Keywords: Erratic, impurities, Dynamo, Pedaling, Pollution, Parasites, Bacteria, Algae, Viruses, Fungi**

## 1. INTRODUCTION

There are many villages in India that do not have the facility of clean and safe drinking water & that is because they lack proper sources for the purpose of filtered water and one major source is electricity. Water can contain many impurities, chemicals and various bacteria's. Such contaminants can cause serious health issues and thus is totally unsafe for drinking. People have to walk miles just to reach to a source of water and that too is not necessarily potable. Thus, the pedal powered water purifier is a decent step towards helping people to get purified water without much sources. The pedal powered water filter works mainly on mechanical energy thus cutting down the need of electricity for the process of water filtration which make it more useful for the areas where electricity is still a major issue. Pedaling is free from pollution, thus it is an eco-friendly system and along with that it also provide healthy exercise. The main objective of this water purifier is to provide clean water by the means of converting the pedal energy into useful energy which can be utilized to purify water.

Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from water. The goal 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 fulfilling the requirements of medical, pharmacological, chemical and industrial applications. 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. Purifying water may reduce the concentration of particulate matter including suspended particles, parasites, bacteria, algae, viruses, fungi, as well as reducing the concentration of a range of dissolved and particulate matter. The standards for drinking water quality are typically set by governments or by international standards. These standards usually include minimum and maximum concentrations of contaminants, depending on the intended purpose of water use.

Visual inspection cannot determine if water is of appropriate quality. Simple procedures such as boiling or the use of a household activated carbon filter are not sufficient for treating all the possible contaminants that may be present in water from an unknown source. Even natural spring water – considered safe for all practical purposes in the 19th century – must now be tested before determining what kind of treatment, if any, is needed. Chemical and microbiological analysis, while expensive, are the only way to obtain the information necessary for deciding on the appropriate method of purification.

## 2.PROBLEM DEFINITION

- i. In-spite of having 71% water on earth only 2% of fresh water available for drinking. World facing fresh water crisis
- ii. 21% of country's diseases are water related. In market water purification systems are available, but they are not reached up to village areas. Also cost is not affordable for many. Maintenance & services problems are involved, less availability of electricity in rural areas.
- iii. Pedal powered water purification meets this problem as this system only works on pedal powered there is no need of electricity & high budget maintenance.

## 3.OBJECTIVES :

- i. Pedal powered water purification by RO method meets the need of people without requiring any electrical energy .
- ii. This filtration system could be brought into remote areas and emergency conditions like flood, earthquakes etc.
- iii. The purpose of this project is to design and fabricate a small scale water purification kit which requires minimum maintenance and which is cost efficient.
- iv. Pedal Operated System can be use for power generation for household functions & also for drip system for agriculture, sprinkler for gardening etc. by Add-Ons

## 4.LITERATURE REVIEW

**Dhruv duggal et al., (2014)** worked on the enhancement of “bicycle operated pump filter”. Their main objective was to pump the water with the help of centrifugal pump for the purpose of irrigation. By pedaling the bicycle at particular rpm water can be lifted to a certain height, thus can also be used at places where water is present at lower ground levels. Physical parameters were determined using various calculations.

**Pratik S. Nagrare et. Al (2017)** created the design of a filter operated by pedaling the pedals attached on a frame by using the principle of Bernoulli. The design was optimized such that it's a stable frame rather than a bicycle so that there would be no mechanical disturbances during the filtration process.

**Vishal garg et. Al (2013)** worked on to reduce the effect of water pump by using belt drives in bicycle. Belt drive is better way for transmission of power from pedal to the shaft of centrifugal pump.

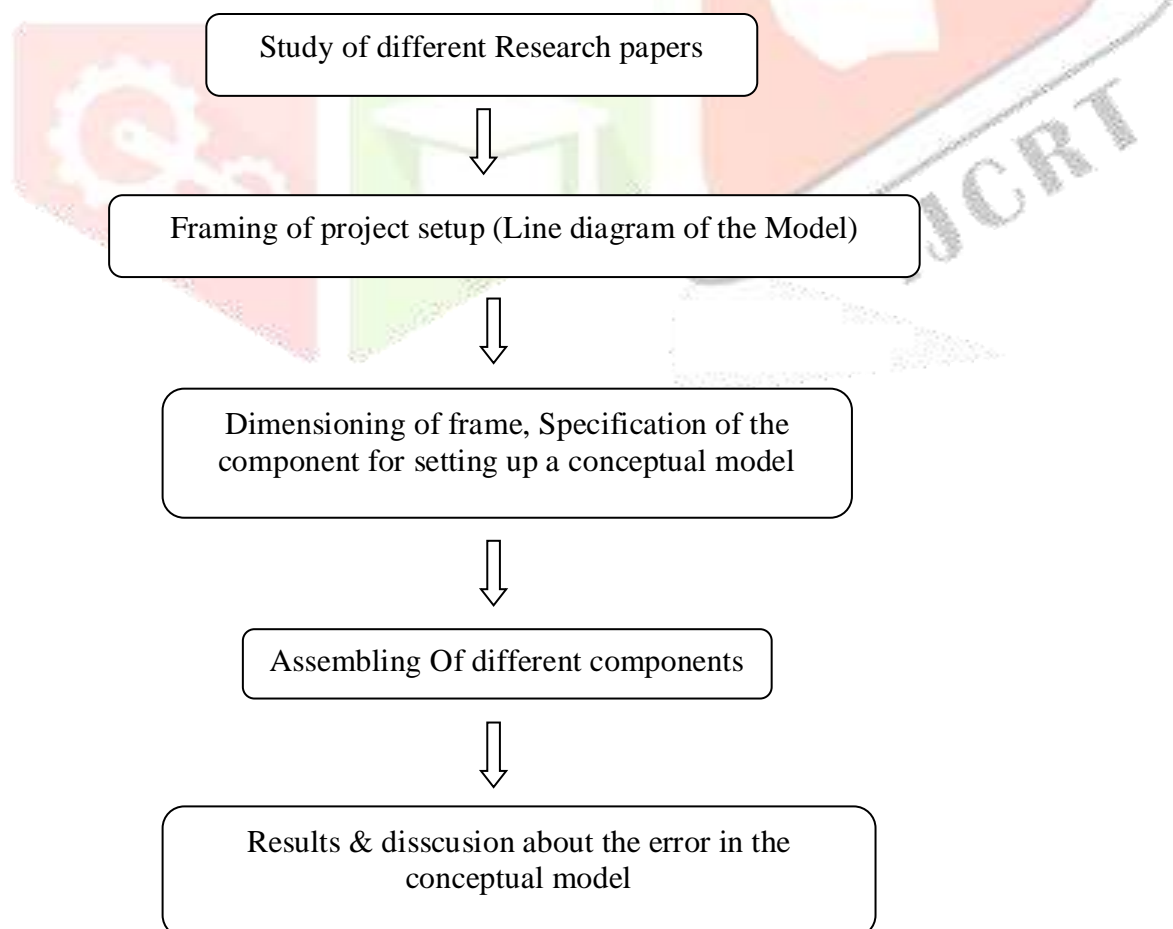
**Sanjay N. Havaladar et. Al (2016)** prepared the design of pump filter by taking mathematic modeling into consideration. They emphasized on the selection of materials based on the dependent variables like flow rate, speed and power. Frictional head loss was included to find out the nature of flow, turbulent or laminar. Forces

were resolved to calculate the exact power required to overcome the friction. Designing by such parameters gave the delivery by pump and thus an estimate time to filter the water.

**Ademola Samuel Akinwonmi et. al (2012)** has prepared pedal power water purification and design was focused on process of conception, invention, visualization, calculation etc. he also made a force analysis to check performance criteria. The physical parameter of design was determined by the appropriate calculation and the practical consideration with some reasonable assumption. It is discovered that the design is simple, cheap, efficient and affordable as could be seen from the readily available materials used. It also use the Bernoulli's principle for the flow calculation with the help of peristaltic pump.

**Peramanan et. al (2014)** has studied the fabrication of Human Power Reverse Osmosis Water Purification Process. The device use pedal to harms human motion to convert it into usable power to run a reverse osmosis filtration system. Osmosis is a natural process in which a liquid from a less concentrated solution flows through a semi permeable membrane to more concentrated solution. Reverse osmosis is an effective method of reducing the concentration of total dissolved solid sand many impurities found in water. The project has been carried out to make an impressive task in the field of water purification method

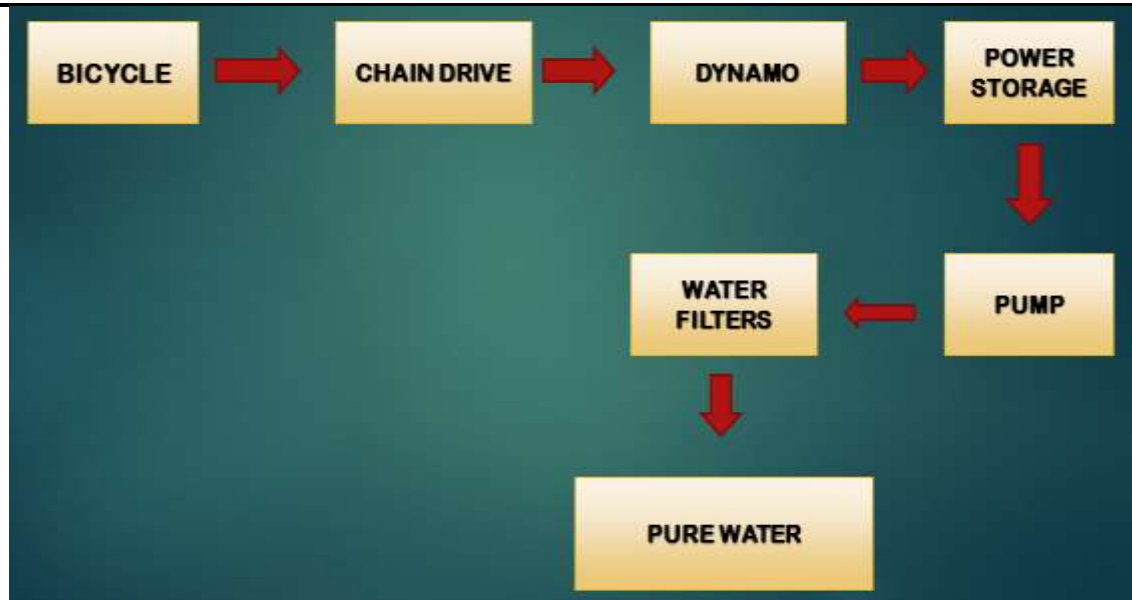
## 5.METHODOLOGY



- i. In operation by pedaling the cycle man power is converted into mechanical energy which is further converted into electric energy in pump.
- ii. Rotor of the pump is attached to rear wheel of bicycle which runs due to friction.
- iii. Pump pumps the water to filter with pressure where dissolved inorganic solids are removed from water.
- iv. Then water is pumped to carbon filter which removes organic matters, chemicals, contaminants and chlorides using chemical absorption.
- v. After carbon filter water is passes through the RO membrane.
- vi. Here water is converted into pure water, where impure water is collected in container.

## 6. PROPOSED METHODOLOGY

Water is present everywhere on earth, but it needs to be purified before it can be consumed. Here comes the difficult part. It needs electricity or fuel along with large systems to purify it and make it consumable. So here we propose a pedal based water purification system that uses pedal power to purify water and make it available for drinking. The design and fabrication of pedal powered water purifier includes sprocket chain system with power generator dynamo along with supporting frame, filters, container with integrated heating element and supporting circuit to achieve this system development. The system uses a pedal fixed sprocket with chain attached to supply circular force to the dynamo to be driven. The power generated by dynamo is then used to store in batteries. The water before getting pressurized is passed through filters to remove large particles and basic filtering. The container on the other end is used to draw pure water from it using a tap. Thus we achieve a pedal powered water purification system as a renewable water purifier.



## 7.SYSTEM DESIGN & COMPONENT

In our attempt to design a special purpose machine we have adopted a very a very careful approach, the total design work has been divided into two parts mainly;

- System design
- Mechanical design

System design mainly concerns with the various physical constraints and ergonomics , space requirements, arrangement of various components on the main frame of machine no of controls position of these controls ease of maintenance scope of further improvement ; weight of m/c from ground etc.

In Mechanical design the component in two categories.

- Design parts
- Parts to be purchased.

For design parts detail design is done and dimensions thus obtained are compared to next highest dimension which are readily available in market this simplifies the assembly as well as post production servicing work.

The various tolerance on work are specified in the manufacturing drawings the process charts are prepared & passed on to the manufacturing stage .The parts are to be purchased directly are specified & selected from standard catalogues.

## 8.EXPECTED RESULT

- i. It is discovered that the design is simple, cheap, efficient and affordable .
- ii. We are expecting that the water that we will take to purify, after purification becomes around 300-450TDS(Total Dissolved Solids) level.
- iii. A single set of candles can purify minimum of 4000 ltrs of water. An average of 15 ltrs of potable is used everyday in a family of 3, which means a single set costs less than 4rs a day to purify water for drinking.

## FUTURE SCOPE

- i. Pedal Operated System can be use for power generation for household functions & also for drip system for agriculture, sprinkler for gardening etc. by Add-Ons
- ii. As designed especially for villages and rural areas of the country where farming and animal husbandry is the main occupation for many, the research on producing a large scale system with low cost and higher efficiency is being studied.
- iii. The major requirement of filters such as sediment filter and carbon filter can be replaced by a single candle purifier known as “life-straw” which consist of physical filtration systems and are tested to kill even protozoans and viruses.
- iv. With the growing rates of impurities and pollution in the environment which directly affects the natural and underground water. A simple purification system without the use of electricity is of a great advantage.

## CONCLUSION

The pedal operated water filtration system is a new system that is useful in developing countries like India to have daily access to safe drinking water all by harnessing the energy of pedal power. Finally pedal water purifier is developed using following components and process. Hence we can collect the purified water. The benefits associated with access to safe drinking water provide a strong argument to increase resource allocations to interventions aimed at further improving the current drinking- water situation, as a key entry point for achieving much wider livelihood benefits. The pedal operated water filtration system is a new system that is useful in developing countries like India to have daily access to safe drinking water all by harnessing the energy of pedal power.

**REFERENCE**

1. Dhruv Duggal “Bicycle operated pump filter” Publisher IJMERR, Vol. 3, No. 3 e-ISSN: 2278-0149(2014)
2. Jayant Gidwani, Amit Kesheorey, Ratnesh Mishra “Pedal powered water pumping and purification” Publisher IJSART-Vol. 2, Issue 5, e-ISSN: 2395- 1052(2016)
3. Vishal Garg, Neelesh Khandare, Gautam Yadav “Design and experimental setup of pedal operated water pump” Publisher IJERT-Vol.2, Issue 1, e-ISSN: 2278-0181(2013)
4. Curtis, V. And Cairncross (2003), S. Effect of Washing Hands with Soap on Diarrhoea Risk in the Community: A Systematic Review. *Lancet Infectious Diseases* 3, pp. 275– 281. Howard, G(2006).
5. Groundwater and Public Health, In: Schmoll O. et al. (eds). *Protecting Groundwater for Health:Managing the Quality of Drinking-Water Sources*, London, International Water Association Publishing, pp. 3–19.
6. Payment, P., Hunter, P. R. (2001), *Endemic and Epidemic Infectious Intestinal Disease and Its Relationship to Drinking Water*, In:
7. Fewtrell L., Bartram J. (eds), *Water Quality Guidelines, Standards and Health*, London, International Water Association (IWA) Publishing, 61–88pp. Garneau, C.
8. McNamara, K. and Chung J. (2008), *Peristaltic Pump Project*, Unpublished Final Project Report, Team D, ME 340.4, 41pp.
9. B. Gonzalez ,S. Alzate, J. Cromartie ,K. Hernandez, Advisor: Dr. Andres Tremante (April 7, 2014), *Bicycle Powered Water Filtration System*, A B.S. Thesis prepared in partial fulfillment of the requirement for the Degree Of Bachelor Of Science In Mechanical Engineering, Florida International University A. S. Akinwonmi, S. K. Adzimah, F.
10. Oppong, Department of Mechanical Engineering, University of Mines and Technology, Tarkwa, Ghana. 2012,*Pedal Powered Centrifugal Pump Purified Water Supply System*, Innovative Systems Design and Engineering ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online) ,Vol 3, No.11