

# **Design and Fabrication of Pedal Power Water Purifier**

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## **Abstract:**

Water is existing everywhere on earth, but it requires to be purified before it can be consumed. Here comes the difficult part. It requires electricity to or fuel along with large systems to purify it and make it accessible. Here we propose a idea of pedal based water purification system that uses pedal power to purify water and make it available for drinking. In our project includes a sprocket chain system with power generator dynamo in conjunction with a supporting frame, copper piping interfaced with filters, container with integrated component and supporting circuit to realize this technique development. The system uses a pedal fixed sprocket with a chain attached to supply circular force to the dynamo to be driven. The power generated by dynamo is then went to power the heating plant which heats up the water during a container to boiling point. The water before getting heated is skilled filters to get rid of large particles and basic filtering. The filtered water is boiled to urge steam which is then skilled copper pipes so as to drive maximum steam through coldness copper pipes which give water on the other end of the pipes. The container on the opposite end is employed to draw pure water from it employing a tap. Thus we procure a pedal powered water purification system as a renewable water purifier.

## *Keywords*

### **I. INTRODUCTION**

We have water problems in rural and urban areas. Water is the most basic necessity for human life. Nearly one billion people in the world lack of it. As we mechanical engineers, are willing to Fabricate a Bicycle Pedal Water purifier which is provided with a filter for purification for drinking purpose. The people who are living near sea or river can use this bi-pedal water purifier. For instance, A water filter can be made from a sequence of layer of natural resource Rock, Gravel and Sand. Now-a-days, there are modern filtration systems able to reduce the amount of unsafe material that can flow through any water system.

### **II. OBJECTIVE**

Our goal is to design a Bicycle attachment to purify water when the rider is pedaling. The water filter removes the impurities from the filter and provides clean water for drinking purposes.

### **III. LITERATURE REVIEW**

Water is the prerequisite for all human and economic development. Safe, clean beverages are scarce. Nearly one billion people within the developing world don't have access to that. Water scarcity is either the shortage of enough water or lack of access to safe water, but the matter goes beyond just water. Within the developing world the provision of fresh water is commonly consuming and expensive. In some areas of the geographical region women and girls, especially, are given the task of walking miles at a time to a water source like ponds or streams to

gather water for their families. More often than not the water being collected is unsafe and filled with diseases. The global organization estimates that the geographical region alone loses 40 billion hours per annum collecting water; the identical as a complete year's labor altogether of France! A study conducted in 2010 by UNICEF as a study on their Millennium Development Goals (Figure 1) shows that quite 1 / 4 of the population in Africa takes longer than half-hour to create one water collection trip. Water results in food security, with continued access to that less crop loss occurs and hunger is reduced. As of today many non-profit organizations have surfaced, all with one goal in common: help fix the water crisis worldwide.

#### **IV. PROBLEM DEFINITION**

##### **Problem Statement**

- 1)Using of chain drive will leads to increase human effort
- 2)Effect on overcoming friction is becoming a waste.

##### **Problem Definition**

To overcome the problem of chain drive, belt drive mechanism is used for maximum effort and also it overcomes the problem of friction and whirling.

##### **Proposed methodology:**

In this,the mechanical power is given to the shaft which is connected to a pump mounted on the bicycle.The power produced by pedaling is transferred to rear sprocket, done by chain drive mechanism.The rear sprocket is connected to pulley which is connected to another pulley on

same shaft and axes.The power produced is supplied to rear sprocket and to 1<sup>st</sup> pulley and to the second pulley.on shaft,from there it is supplied to the pump.

Pump inlet is connected to surge tank pump.outlet is connected to the water purifier for purification with this setup water can be purified when it is needed.

##### **Working principle**

There are three major principles of bicycle powered water purifiers.

- 1.Power transmission through chain drive.
- 2.Bernoulli's Principle.
- 3.Power transmission through pulley belt arrangement.

##### **1.Power transmission through Chain drive**

Most of the power transmission is connected to the rolling are known as the transmission chain.chain drive is provided in the bicycle and motorcycles.It is also used in a wide variety of machines besides vehicles.The chain drive can transmit the mechanical power from one place to another place.

##### **2.Bernoulli's principle**

It is a concept of fluid dynamics.The speed of a fluid increases pressure decreases.A better pressure pushes(moves forward)fluid towards lower pressure.The change in exceedingly fluid speed must be

Matches by a change in pressure(force)be approximate in water,air or any other fluid that should be a very low viscosity

### **3.Power transmission through pulley belt arrangement**

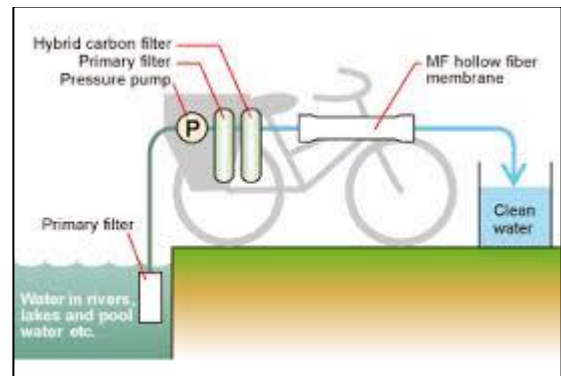
The belt is fixed to a material that is linked between the two or more shafts. Belts are the most affordable utility of power transmission shafts that will not be axially aligned.The belt runs Smooth and less noise and the cushion motors (fabric case filled with soft material) and bearings against load changes.The belt moves in the circular motion.

#### **Current Products**

Currently two products consisting of bicycle powered filtration systems exist. These are the Japanese-based Cycloclean and Aqueduct.

#### **Cycloclean**

The only company that fabricates a bicycle powered water filtration system. The product is essentially made for emergency use, it consists of having a purifying case attached on a rear seat of the bicycle and because of its design the user can ride it to any destination where it may be difficult for other types of transportation to access. The bike is capable of purifying almost any type of water source i.e. ponds, rivers, lakes, bathtub and pools . The device is powerful enough to siphon water from a depth of five meters . The purifying system consists of three filters, a pressure pump, two water hoses and one manual fitting as illustrated in Figure 2. It should be emphasized that the system is capable of producing 5 liters of clean water every minute. Furthermore, the bike only works in a stationary position and does not contain a form of storage.



**Schematic of Cycloclean**

#### **WATER**

#### **FILTERS**

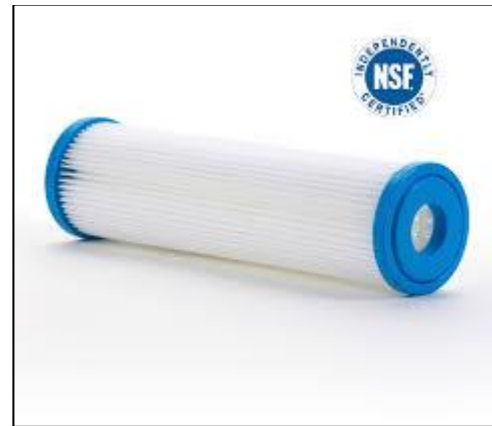
Water filtration systems have changed the way we've been ready to consume our water on a daily basis. A filter generally removes any impurities by flowing the water through a series of screens where the unwanted particles are going to be absorbed or caught onto a screen mesh. The kinds of filters have progressively advanced since the 19th century. There are various processes used counting on the sort of contaminants being removed.

Several methods out there don't require the utilization of such advanced materials also.As an example, a filter is made up of a sequence of layers of natural resources: rock, gravel, or sand. Figure 4 shows a pillow-stuffing filter where cloth, gravel or sand, and rocks are accustomed to filter water. This can be an early technique that utilizes natural resources to filter large contents out of the water. However, the method requires boiling water so as to get rid of any harmful bacteria which will cause an individual to be ill. Nowadays, there are modern filtration systems ready to reduce the quality of unsafe material which will flow through any water system.

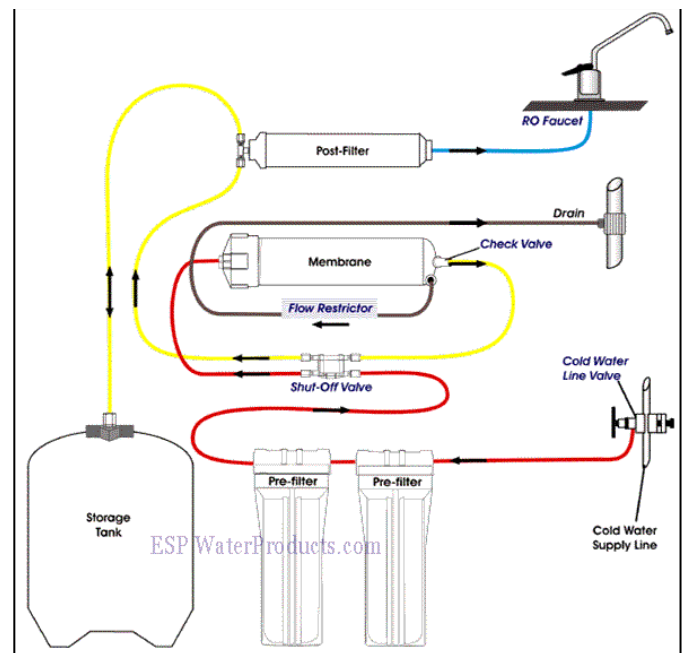


Figure 4 : Pillow Stuffing Filter

One modern filtration system is three-step water purification consisting of three stages: Sediment filter, Kinetic Degradation Fluxion (KDF) Filter, and an activated carbon filter. The first layer is the sediment filter, as seen in Figure 5 that can remove any large matter from the water. These filters are generally made of pleated cellulose: a collection of natural fibers that are densely compacted. The KDF filter is the stage where the excess chlorine is removed and converted to chloride. The last step in this procedure flows through an Activated carbon filter. The charged carbon particles attract other charged contaminants such as heavy metals, lead and copper.



Pleated Cellulose Filter (Sediment Filter)



### Reverse Osmosis Filtration System

There are other unique and complex water filtrations systems, such as the reverse osmosis process, that can eliminate almost any contaminants, including radioactive particles. As shown in pillow stuffing filters, reverse osmosis is a high pressure-driven filtering system that uses a quantity of filters and membranes to eradicate most contaminates. However, removing some of these

essential minerals does not mean the water is safe to drink. Also, this approach can be generally expensive since there are a variety of filters required to flow the water through.

bacteria that may be found in ponds, lakes, rivers, canals, etc.

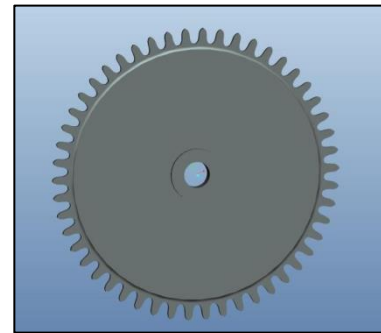
<b>TYPICAL REJECTION CHARACTERISTICS OF R.O. MEMBRANES</b>	
Elements and the Percent R.O. Membranes will remove	
Sodium	85 - 94%
Sulfate	96 - 98%
Calcium	94 - 98%
Potassium	85 - 95%
Nitrate	60 - 75%
Iron	94 - 98%
Zinc	95 - 98%
Mercury	95 - 98%
Selenium	94 - 96%
Phosphate	96 - 98%
Lead	95 - 98%
Arsenic	92 - 96%
Magnesium	94 - 98%
Nickel	96 - 98%
Fluoride	85 - 92%
Manganese	94 - 98%
Cadmium	95 - 98%
Barium	95 - 98%
Cyanide	84 - 92%
Chloride	85 - 92%

% may vary based on membrane type water pressure, temperature & TDS

**MAIN COMPONENTS**

1. Bicycle
2. Power transmitting unit  
(Chain drive from rear wheel hub to pump shaft)
3. Inlet and outlet tubes of the Centrifugal pump
4. Bucket of water
5. Filter
6. Sprocket

**SPROCKET**



**Typical rejections using Reverse Osmosis**

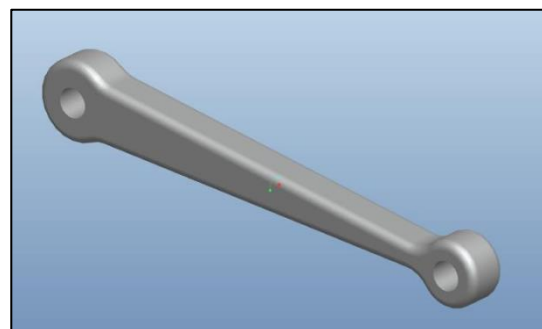


**3-Way Inline Water Filter**

**3-Way Inline Water Filter :**

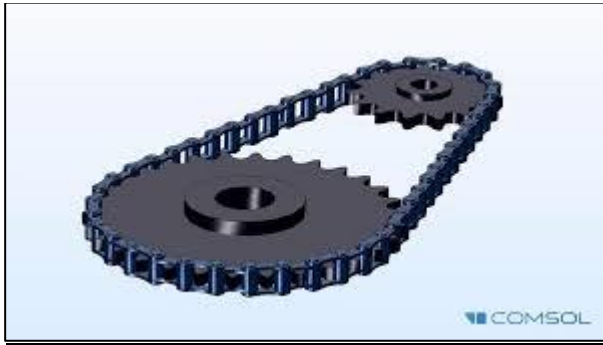
This product includes the entire package where the filtration is inexpensive and removes any harmful

**CRANK ARM**



**DRIVE**

**CHAIN**



## **WATER FILTER**



A water filter removes impurities from water by means of a fine physical barrier, a chemical process or a biological process.

## **V. ADVANTAGES**

1. Operated by pedal power and therefore can be used in areas where electricity is irregular or insufficient.
2. Simplistic in design, operations and handling.

## **VI. CONCLUSION**

After completing the project, conclude that our project is simple in construction and compact in size for use. Manufacturing of machines is easy and the cost of the machine is less.

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