

DESIGN AND FABRICATION OF WATER FILTRATION VEHICLE

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Abstract – This paper presents fabrication and experimentally investigates the working of Pedal Powered Water Pump filtration (WFV) along with its purification which had used for pure drinking water supply and garden irrigation. WFV will consist of a centrifugal pump operated by pedal power. Water is the most basic necessity for life yet nearly one billion people in the world lack to access it. Given that our design must target a demographic that includes some of the poorest regions in the world, reliability is one of the primary factors incorporated into the design. The functionality of the pump and filter system needs to require as little maintenance as possible. The design must also be user-friendly as the assumption will be made that users will have no experience with any vehicle of this type. Once the design is optimized, materials within the build will be considered to find the most cost-effective method of manufacturing. The results indicate that the WFV will give a considerable amount of discharge and head.

carbon, chemical processes carried out called as chlorination.



Fig-1 Difficulties Some Communities encounter to have Access to Purified Water.

Key Words: Filtration System, Pedal crank, Peristaltic pump, Sump, Local dwellers, pure water

1.INTRODUCTION

This project proposes to take on challenges associated with the accessibility and cleanliness of water in developing countries by designing and building a filtration system and sidecar that are portable, durable, and cost-effective. Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from contaminated water.

From fig 1 seen that, Drinkable water sources are distant from most villages in Ghana. Women and children especially spends hours of labour just to meet the basic needs of their families.

The goal of this process is to produce water fit for human consumption (Drinking water).It is also used for 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

The objective of this work is therefore to design a mechanism to be used with water filter to supply purified water for villages by harnessing the human pedal power and the nearby streams in these villages in order to reduce the labour, cost and weariness caused by transporting and sanitizing drinkable water for use in the homes

1.1 Principle of operation

This design is composed of a peristaltic pump powered by paddling, a carbon filter and hose or flexible tube as shown in Fig.1. An operator sits on the seat and pedals, the pedal crank transfer the motion to the rotor thus the rollers. The tube is squeezed by the set of rollers to move the fluid. By constricting the tube and increasing the low-pressure volume, a vacuum is created to pull the liquid into the tube. Once in the pump, the liquid is pushed through the tube by compressing the tube at a number of points in contact with the rollers. The media is moved through the tube with each rotating or oscillating motion. The water is then forced through a filter which removes chemicals, bad taste and smell, pollutants, turbidity and other micro-organisms.

Four-bar slider mechanism

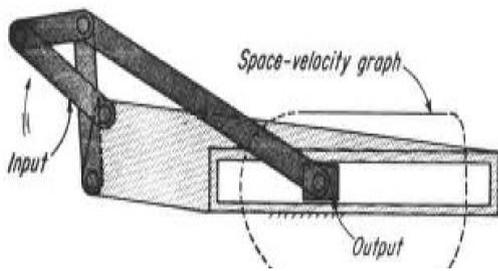


Fig 2: Slider Crank Mechanism

1.2 Problem statement

More than 1.1 billion people in the world do not have access to clean drinking water. Over 500 children die each day because of water related diseases. Often water sources like wells, river, lakes are distant ,women / men must travel minimum of 2 to 5 km to fetch the water, this is time consuming and laborious.

1.3 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.



Fig -3: Water Filter Tricycle

1.4 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.

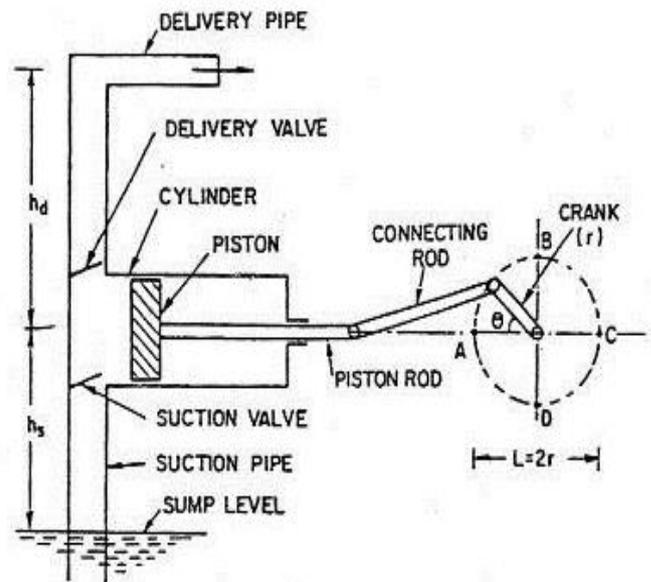


Fig -4: Reciprocating Pump

1.5 Filter

The most common type of filter is a rapid sand filter. Water moves vertically through sand which often has a layer of activated carbon or anthracite coal above the sand. The top layer removes organic compounds, which contribute to taste and odour. The space between sand particles is larger than the smallest suspended particles, so simple filtration is not enough. Most particles pass through surface layers but are trapped in pore spaces or adhere to sand particles. These filters remove suspended solids larger than a nominal 25-micron size.

2. MATERIAL AND METHODS

[1]

A bicycle is used for this purpose with the general arrangement as shown in Fig. 1. The type of pump selected for this work is peristaltic pump. A peristaltic pump is a positive displacement pump used for pumping a variety of fluids. The fluid is contained within a flexible tube fitted inside a circular pump casing. A rotor in the form of plate with a number of "rollers", "shoes" or "wipers" is attached to the external circumference and connected to the sprocket. As the rollers compress the hose and move away from the inlet Irjet template sample paragraph, Irjet template a

vacuum is created drawing in liquid. The rollers work together to capture liquid between the pinched areas of the tube and move the liquid toward the discharge. (A.S. Akinwom, 2012) The front roller leaves the hose, opening the captured area while the back roller pushes the liquid out the discharge. This process is called peristalsis and is used in many biological systems such as the gastrointestinal tract. This type of pump is selected for this work because of the following characteristics: because of its wider range of operating speeds, thus efficient at both high and low revolution per minutes (rpm), dry running/self-priming/seal less, creation of high vacuum for suction lift application, smooth passage through the pump thus no checks or obstructions, relatively high discharge pressure.

While selecting any m/c it must be checked whether it is going to be used in large scale or small scale industry In our care it is to be used in small scale industry So space is a major constrain .The system is to be very compact it can be adjusted to corner of a room.

[2]

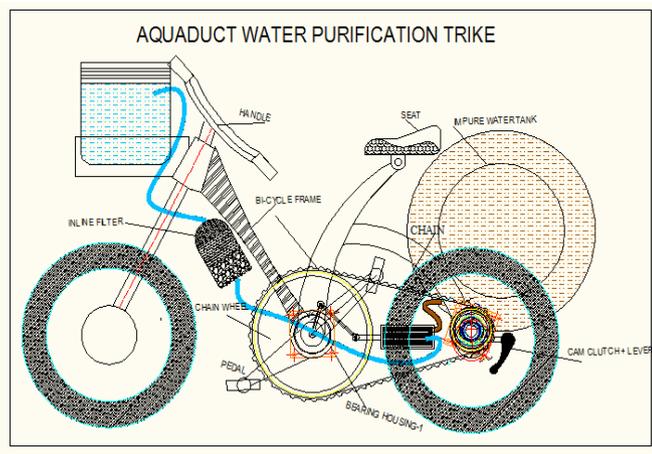


Fig -4: Water filtration vehicle

2.1 Materials Selection

Peristaltic pump in the design as shown in Fig. 2 consists of a tube which is squeezed by a set of rollers or shoes to move fluid. By constricting the tube and increasing the low-pressure volume, a vacuum is created to pull the liquid into the tube. The material used for the peristaltic pump is mild steel. This material is used for the pump casing, plates, and shaft. The problem most likely to cause damage to the design is corrosion. For this reason to protect the shaft from corrosion it is subjected to hardening.

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Part name	Material details
Barrel	Steel
Piston rod	Steel hard chrome plated
Seal	Synthetic oil resistant rubber
End covers	Close grained cast iron
Surface treatment	End cover and cylinder barrel outside-auto finish enameling
Piston	Aluminum
Media	Liquid
Temp. range	0 ° c to 85 ° c
Pressure range	Up to 10 bar

Table -1: Material Table

3. LITRATURE SURVEY

- [3] [1] Mohanad El- Harbawi, “Cell Proliferation without Neurogenesis in Adult Primate Neocortex,”
- [4] Purify the water using the dual purpose, first one is fit for human consumption and another is reduce human fatigue to carry water from lake and river.
- [5]
- [6] [2] Sunil J. Wimalawansa, International Journal of Emerging Technology and Advanced Engineering,
- [7] [3] Fredrick Oppong, “Purified water supply device,” Innovative Systems Design and Engineering.

Access to clean uncontaminated water will have a profound impact on controlling the spread of water-borne pathogens, toxins. We should explore new paradigms and adapt existing methods and practices to changing situations, including demographic and technological changes, global warming, and climatic changes, as well as future water demands.

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 sample paragraph .Irjet template sample paragraph. Irjet template sample paragraph

[8] drinking-water situation, as a key entry point for achieving much wider livelihood benefits.

[4] Jayant Gidwani, "Pedal Powered Water Pumping," Swami Vivekananda College Of Engineering Indore.

Pedal powered water pumping and purification meet these problem as this system only works on pedal powered there is no need of electricity neither to pump nor to purify the dirty water. which is used for pure drinking water supply and irrigation in remote areas. pedal powered water pumping and purification is not only free from pollution but also provide healthy exercise. pedal powered water pumping and purification reduces the rising energy costs.

[5] Sanjay N.Havaladar, "Pedal Operated Water Filter, International Journal of Current Engineering, pune.

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. 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.

[6] Eric Harshfield Senior, Water Purification in Rural South Africa, International Journal for Service Learning in Engineering,

This paper presents a sustainable development project and goal was to implement a sustainable and contextually appropriate water purification and distribution system.

3.1 Literature Review :

The most common type of filter is a rapid sand filter. Water moves vertically through sand which often has a layer of activated carbon or anthracite coal above the sand. The top layer removes organic compounds, which contribute to taste and odour. The space between sand particles is larger than the smallest suspended particles, so simple filtration is not enough. Most particles pass through surface layers but are trapped in pore spaces or adhere to sand particles. Effective filtration extends into the depth of the filter. This property of the filter is key to its operation: if the top layer of sand were to block all the particles, the filter would quickly clog.

To clean the filter, water is passed quickly upward through the filter, opposite the normal direction (called back flushing or backwashing) to remove embedded particles. Prior to this step, compressed air may be blown up through the bottom of the filter to break up the compacted filter media to aid the backwashing process; this is known as air scouring. This contaminated water can be disposed of, along with the sludge from the sedimentation basin, or it can be recycled by mixing with the raw water entering the plant although this is often considered poor practice since it re-introduces an elevated concentration of bacteria into the raw water.

4. CONCLUSION

This project is very good and new concept in the field of water filtration because from this project we can filter the water at a same we transport the water from one place to another placed saving the time as well as effort of the man. Also this project is not required any energy to drive the project. This project is manufacture by the simple equipment .This project required the only one man power and saving the cost of the man power.

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REFERENCES

- [9] Mohana-El Harbawi, "Cell proliferation without neurogenesis in adult primate Neocortex", Science, Vol.5 No.2, 2010 ISSN165-175 [1]
- [10] Sunil J. Wimalawansa, International Journal of Emerging Technology and Advanced Engineering, USA(ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 3, Issue 12, December 2013 [2]
- [11] Fredrick Oppong, "Purified water supply device," Innovative Systems Design and Engineering, ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online) Vol 3, No.11, 2012 [3]
- [12] Jayant Gidwani, "Pedal Powered Water Pumping," Swami Vivekananda College Of Engineering Indore. IJSART - Volume 2 Issue 5-MAY 2016, ISSN [ONLINE]: 2395-1052 [4]
- [13] Sanjay N.Havaladar, "Pedal Operated Water Filter, International Journal of Current Engineering, pune. E-ISSN 2277 – 4106, P-ISSN 2347 – 5161. [5]
- [14] Eric Harshfield Senior, Water Purification in Rural South Africa, Department of Chemical Engineering University of Virginia, International Journal for Service Learning in Engineering, Vol. 4, No. 1, pp. 1-14, Spring 2009 ISSN 1555-9033 [6]

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