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 ijirset@gmail.com

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Design Pedal Powered Water Purification System

Ravindra Shende¹, Prakaran Bansod², Sushant Giradkar³, Pradip Shelke⁴

Asst. Professor, Department of Mechanical Engineering, TGPCET, Nagpur, Maharashtra, India¹

Student, Department of Mechanical Engineering, TGPCET, Nagpur, Maharashtra, India²

Student, Department of Mechanical Engineering, TGPCET, Nagpur, Maharashtra, India³

Student, Department of Mechanical Engineering, TGPCET, Nagpur, Maharashtra, India⁴

ABSTRACT: A Most of the earth is covered by Water, however it should be cleansed before it very well may be burned-through. For the most part water filtration needs power or fuel alongside huge frameworks making filtered water all the more exorbitant. However, there are a few water decontamination strategies which needs no power with less expense. One of the filtration strategy is pedal controlled water refinement (PPWF). In this cleaning interaction primarily fundamental Bernoulli's guideline is utilized which expresses that a speed up a liquid happens all the while with a reduction in pressure or a lessening in the liquid's possible energy. Numerous individuals chipped away at this kind of water sanitization framework and thought of various plans. So here we are looking into changed pedal controlled water cleansing (PPWF) strategies proposed by a few creators.

I. INTRODUCTION

Visual inspection cannot be determined if water is of appropriate quality . Simple procedure such as boiling or the used of 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 practice 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 .

The water purification system can be operated by means of many ways like electrical energy, solar energy, thermal energy, gravitational potential energy, magnetic energy etc but needs much resources making the process costlier. But there are newer methods like pedal powered water purification (PPWF) which makes process less costlier and several authors worked on it.

The project has the following objectives

- Provide a low cost machine .
- Replacement of filter membrane Easier .
- The mechanism is Pedalling , Processing and filtering .

Keywords :

Cycling Action , Human Motion

II. LITERATURE REVIEW

Anand and ramprasad et al 2017 , reviewed the literature regarding a variety of portable water purification techniques like boiling, solar water disinfection, sedimentation and ceramic filters coagulation, adsorption (activated carbon), chlorination, uv irradiation, ultra filtration, reverse osmosis and other combined methods that have been predominantly used at the household level.

Jayant Gidwani et al 2016 , In this paper author mentioned about fan pump (ppwp) along with its purification which has been used for pure drinking water supply and garden irrigation. PPWP will consist of a centrifugal pump operated by pedal power. The centrifugal pump is positioned on its stand in such a way that driven shaft of the centrifugal pump was butted to the bicycle wheel. PPWP provides drinking water lubrication of ppwp. And experimentally investigates the working of pedal powered water and irrigation in remote areas where electricity is not available



Mogaji p. B. Et al 2016 has analyzed & studied the development of an improved pedal powered water pump, can be used for irrigation and drinking water purposes. It is more productive operated pumping system and is time saving. The system is composed of a reciprocating pump powered by pedaling. The pedal power is being transmitted to the pump via a chain drive.

M. Jayamoorthy, B. Sridhar et al 2017 mentioned about the Purification system of water by cycling pedaling is useful in purifying the water by means of a cycle operated with reverse osmosis process. It includes the cycle pedal being rotated and inlet being connected to the membrane of the reverse osmosis setup. It is used to increase the discharge level of the water involved in purification. Hence the amount of water used can be purified and used by these means of purification with a lots of water borne diseases. This method is used in providing the purified water that can be available for all people in a very low cost

Dhruv Duggal Et al 2014 reviewed the design and construction of bicycle operated pump filter is explained which is used in irrigation and filtration at small scale.

COMPONENT USED

- Frame
- Battery
 - Water filter
 - Cycle Chain
 - Dynamo
 - Pedal

Frame :-

A Frame is a structural System That supports Other Components of a Physical components of a Physical Construction . A basic Structure designed to bear a load in a lightweight economical manner . on this frame all the assembly of the project is mounted

Battery :-

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.

These are the main power sources to run the water purification filters. This battery gets charged from the dynamo.



Water Filter :-

A water filter removes impurities by lowering contamination of water using a fine physical barrier, a chemical process, or a biological process. Filters cleanse water to different extents for purposes such as providing agricultural irrigation, accessible drinking water, public and private aquaria, and the safe use of ponds and swimming pools.



Cycle Chain :-

A bicycle chain is a roller chain that transfers power from the pedals to the drive-wheel of a bicycle, thus propelling it. Most bicycle chains are made from plain carbon or alloy steel, but some are nickel-plated to prevent rust, or simply for aesthetic Bicycle chain can be very energy efficient: one study reported efficiencies as high as 98.6%.



Fig shows the chain

Dynamo :-

A dynamo is an electrical generator that produces direct current with the use of a commutator. Dynamos were the first electrical generators capable of delivering power for industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternator, and the rotary converter. Today, the simpler alternator dominates large scale power generation, for efficiency, reliability and cost reasons. A dynamo has the disadvantages of a mechanical commutator. Also, converting alternating to direct current using power rectification devices (vacuum tube or more recently solid state) is effective and usually economical. The electric dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through Faraday's law of induction. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. Due to Faraday's law of induction the motion of the wire within the magnetic field creates an electromotive force which pushes on the electrons in the metal, creating an electric current in the wire. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets, which are usually called field coils. Here dynamo is attached to the smaller free wheel .As the wheel rotates the dynamo rotates. Here dynamo plays a major role in creation of power.



Fig shows the

Pedal :-

The bicycle pedal is the part of a bicycle that the rider pushes with their foot to propel the bicycle. It provides the connection between the cyclist's foot or shoe and the crank allowing the leg to turn the bottom bracket spindle and propel the bicycle's wheels. Pedals usually consist of a spindle that threads into the end of the crank and a body, on which the foot rests or is attached, that is free to rotate on bearings with respect to the spindle. Pedals were initially attached to cranks connecting directly to the driven (usually front) wheel. The safety bicycle, as it is known today,

came into being when the pedals were attached to a crank driving a sprocket that transmitted power to the driven wheel by means of a roller chain.

Pedals are connected to the main free wheel. There to chain is attached to the small free wheel



Free wheels of Bicycle

in mechanical or automotive engineering, a freewheel or overrunning clutch is a device in a transmission that disengages the drive shaft from the driven shaft when the driven shaft rotates faster than the driveshaft. An overdrive is sometimes mistakenly called a free wheel, but is otherwise unrelated. The condition of a driven shaft spinning faster than its driveshaft exists in most bicycles when the rider holds his or her feet still, no longer pushing the pedals. In a fixed-gear bicycle, without a free wheel, the rear wheel would drive the pedals around. The simplest freewheel device consists of two saw-toothed, spring-loaded discs pressing against each other with the toothed sides together, somewhat like a ratchet. Rotating in one direction, the saw teeth of the drive disc lock with the teeth of the driven disc, making it rotate at the same speed. If the drive disc slows down or stops rotating, the teeth of the driven disc slip over the drive disc teeth and continue rotating, producing a characteristic clicking sound proportionate to the speed difference of the driven gear relative to that of the (slower) driving gear.

CUNSTRUCTION

RAW MATERIAL USED

Frame

Material : Mild steel

Pulley

Material: Grey cast iron

READY MATERIAL USED

Battery

Water filter

Dynamo

Pedal

Nut bolt

Methodology :-

In this Project we generally give mechanical power to the shaft , and the shaft is connected to the Dynamo which is mounted on bicycle.

The power generated by pedaling is transfer to the rear sprocket as is done bicycle via chain drive . The rear sprocket is connected to pulley , which is connected to the another pulley on the same shaft and axes . The power generated is being supplied to the rear sprocket then to the pulley connected , then the second pulley is mounted on the same shaft .

The power by this shaft is transferred to the Dynamo.

The inlet of the dynamo is connected to the surge tank via pipe .outlet of the dynamo is connected to the water purifier for purification process . with the help of this setup we can have a discharge a certain head if required or we can purify water when needed.



CAD DIAGRAMME



FUTURE SCOPE

- In disaster prone areas of flood famine , earthquakes etc.
- It can also be used for household applications .
- Filtering local sources of water would eliminate the need to import large quantities elsewhere , saving relief funds for alternate uses .

ADVANTAGES

No Electricity Needed

Village water Purification

Cruises

Boats

Life saving Equipment

It can also be used to generate power

.It can also be used as an exercising tool.

It can also use for watering gardens and for small area crops

DEMERITS

Humans are required

It can be only used for a short time as manpower is a limited resource

CONCLUSION

The Pedal Operated Water Purification project is intended to provide clean drinking water to anyone In need. The lack of clean water supplies could save countless lives every year. A small scale Water filtration system could be brought into remote areas and provide the means of purifying previously contaminated water. Filtering local sources of water would eliminate the need to import large quantities from elsewhere, saving relief funds for alternate uses. The purpose of this project is to design and manufacture a small scale water purification system which requires minimal maintenance and is cost efficient. To power this system by using human effort and using pedal mechanism the Mechanical energy converted into electrical energy and system will be explored. This report describes the process and materials necessary to create a small scale water purification system. Detailed parts, materials, and design specifications are created according to industry standards. All design specifications have been produced to create a water purification system

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