Power Pumping Purification and water dropping system

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Abstract

This study describes the construction of a pedal-powered water pump (PPWP) and experimental investigations into its operation and purification for use in irrigation of gardens and the supply of pure drinking water. Pedal power will be used to drive a centrifugal pump as part of PPWP. The centrifugal pumpis set up on its stand so that the driven shaft of the pump butted against the wheel of the bicycle.

PPWPWP, or pedal-powered water purification, is an environmentally beneficial technology. The PPWPWP solely uses mechanical energy—no electricity is used. PPWPWP offers irrigation and drinking water in rural regions where energy access is still a big issue. In addition to promoting an environmentally friendly environment, cycling promotes good health. In addition to being pollution-free, PPWP also offers beneficial exercise. The cost of electricity is increasing due to PPWPW. PPWPWP was created as a portable irrigation system that may be utilised in a variety of locations.

A centrifugal pump that uses pedal power makes up PPWPWP. The driving shaft of the centrifugal pump has come into contact with the bicycle wheel because of how the centrifugal pump is set up on its stand. Bye is pedalled, the wheel revolves, turning the centrifugal pump, which releases water from the sump. In rural locations without access to electricity, PPWP offers irrigation and drinking water. In addition to being pollution-free, PPWP also offers beneficial exercise. PPWP lowers the rising cost of energy.

Keywords- *centrifugal pump, pedalling, pre-purifier, R.P.M.*

INTRODUCTION

PPWPWP, or pedal-powered water purification, is an environmentally beneficial technology. The PPWPWP solely uses mechanical energy—no electricity is used. PPWPWP offers irrigation and drinking water in rural regions where energy access is still a big issue. In addition to promoting an environmentally friendly environment, cycling promotes good health. In addition to being pollution-free, PPWP also offers beneficialexercise. The cost of electricity is increasing due to PPWPW. PPWPWP was created as a portable irrigation system that may be utilised in a variety of locations.

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MATERIAL REQUIRED

1.Bicycle frame
2.Centrifugal pump
3.Drive and driven pulley
4.V-Belt
5.RO filter kit
6.water storage tank
7.PVC pipe and valve

8.Flexible Rubber pipe

PROBLEM STATEMENT

a) Use of chain drives increasing human effort.

b) Centring of the axis of the driver to the driven causing whirling.

c) Effort getting waste to overcome the friction.

PROPOSED METHODOLOGY

In this project, the shaft is often powered mechanically, and the shaft is attached to a pump that is placedon a bicycle.

Like in a bicycle, the power generated by pedalling is transmitted to the back sprocket through a chain drive. The pulley that the rear sprocket is attached to is connected to another pulley on the same shaft andaxis. The power produced is first sent to the rear sprocket, then to the linked pulley, and finally to the second connected pulley situated on the same shaft.

The pump receives the power from this shaft.

The surge tank and the pump's intake are linked via a conduit. The water purifier is attached to the pump'soutlet for the purpose of filtration.

WORKING PRINCIPLE

There are only three major principles on which our working model generally works:

1. Power transmission through chain drive mechanism.
2. Bernoulli's equation
3. Power transmission through pulley belt arrangement

Power Transmission through Chain Drive: Chain drives are a method of moving mechanical power fromone location to another. It frequently serves to transmit power to a vehicle's wheels. bicycles and motorbikes in particular. In addition to cars, it is employed in a broad range of other machinery. The drive chain or transmission chain, which is most frequently used to transmit power, passes over a sprocket gear and the teeth of the gear mesh with the holes in the chain links to transmit power. When the gear is turned, the chain is pulled, adding mechanical force to the system.

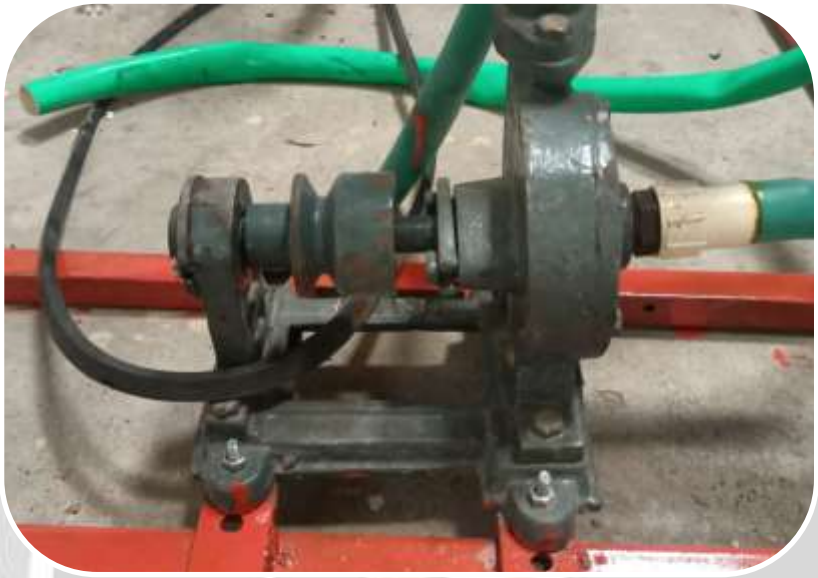
Bernoulli's principle: According to Bernoulli's principle, which governs fluid dynamics, a fluid's speed increases concurrently with a reduction in pressure or potential energy. The idea bears Daniel Bernoulli's name because he first described it in his book Hydrodynamic in 1738. There are several variations of
Bernoulli's equation for various types of flow, which may be achieved by applying Bernoulli's principle to various types of fluid flow. For incompressible flows, such as the majority of liquid flows and gases moving at low Mach numbers, Bernoulli's equation may be expressed in its simplest form. Compressible flows at higher Mach numbers may be treated using more sophisticated forms (see the Bernoulli equation's derivations).

Power transmission through pulley belt arrangement: The cheapest method of power transfer between shafts that may not be axially aligned is through the use of belts. Through the use of a belt and pulley with unique design, power is transmitted. They protect the motor and bearings from fluctuations in load while operating quietly and smoothly. This system is created to minimise rpm in accordance with requirements and to transmit electricity.

WORKING OF THE MODEL

In the "pedal powered water pumping and purification" operating model, we are powering the shaft that is attached

to the pump. The purifier is then linked to the pump, purifying the water at the same time. The power generated by pedalling is transferred from the front to the rear sprocket via a chain drive
mechanism, and the same rotational speed is subsequently transferred to the pulley that is positioned onthe same shaft. Through a belt drive system, this pulley sent power to the main shaft, which was then coupled with the pump. The exit of this pump is linked to the filter, which cleans the water.



SPECIFICATION OF COMPONENTS

1.	Diameter of sprocket	0.168m (driven)	
2.	Diameter of sprocket	0.065m (driver)	
3.	Centre distance between driver and driven	0.48m	
4.	No. of teeth of driver	45	
5.	No. of teeth on driven	18	
6.	Casing diameter	0.15	
7.	Discharge diameter	0.02m	
8.	Suction diameter	0.025m	
9.	Datum height	0.9m	
10.	Delivery head	1.03m	
11.	Suction length	1.1m	
12.	Delivery length	2m	
13.	Rotating speed	430(N2) 130(N1) (with load) 680(N2) 150(N1) {no load}	
14.	Total distance	0.86m	
15.	Shaft to pump	0.77m	
16.	Diameter of small pulley (1)	0.26m	
17.	Diameter of small pulley (2)	0.12m	
18.	Crank radius	0.18m	

RESULTS AND DISCUSSION

1.Model calculation

$L1 = \pi(r1 + r2) + 2x + (r1 - r2)2 / 48$

$= \pi (8.2 + 3.2) + 2 * 48 + (8.2-3.2)2/48$

$L1 = 1.32m$

2.Calculation of chain

Pitch of chain
P=AB = 2 AO sin (Θ/2) = 2* (D/2) sin (Θ/2)
D= diameter of the pitch circle
T= No. of teeth on the sprocket
So, P = D sin (360/2T)
P = 16.8 sin (360/2*45)
P = 1.171

3.Pitch Circle diameter
D= p cosec (180 /T)
P = D sin (180/T)
D=1.171 cosec (180/45)
D= 16.8cm

4.Length of chain
L = K.P
K= no. of the chain links
P= pitch of chain
The no. of chain links –
K = (T1 + T2 /2) + (2x /P) + {T2 – T1 / 2π} 2 (P/x)
= (45 + 18 /2) + (2*48 /1.17) + {18 – 45/2π}2 (1.171/48)
K = 1.13m

5. Discharge
Discharge = 5 liter in 6.2 sec
6.2 = 5/1000
= 0.00080 m3/sec
= 0.806 lit/sec

6. Velocity
Velocity = discharge/ area
= .00080/(π*r2)
= .00080/ π (0.025/2)2
d= diameter of suction
D= diameter of casing
{v2= 1.63 m/sec}

7. Calculation of coefficient of friction

= 0.0008+{0.05525/(5652125.279)0.237}

μ1 = 0.0021

8. Head loss due to friction
H2 = μ1v
2L/2gd
= .0021*3.1*(1.63)2/ 2*9.81*0.025
= 0.035m

9. Pressure
P1= 0.08825 bar
P2 = 0.29430bar

10. Velocity
1. V= 1.04 m3/sec
2. V = 1.63m3/sec

11. Torque
π| = 48.54 Nm

12. Power delivered by pump
= ρgHp Θ
= 1000*9.81*1119*0.0008
P = 8781.9

CONCLUSION

We are aware that one of the biggest issues in rural areas continues to be energy. People suffer with the lack of water throughout the heat. These issues are addressed by pedal-powered water pumping and purification because none of these processes requires energy to operate because they are pedal-poweredexclusively. of Pedal Powered Water Pump and its purification, which is utilised for irrigation and clean drinking water supply in outlying locations. Pumping and purifying water with a pedal-powered system is not only pollution-free but also good for your health. The growing cost of energy is decreased through water filtration and pumping driven by pedals. A portable pedal-powered water pump and purifying systemthat may be used for irrigation in various places

PROBLEM DEFINITION

To overcome the above said problems belt drive is used instead of chain drive which is utilizing maximumeffort, previously which was going waste in overcoming friction. Also the whirling problem is resolve.

COST ANALYSIS

NAME OF PART	**PRICE**
Bicycle frame	1500
Centrifugal pump	2220
Drive and driven pulley	350
V-Belt	250
RO filter kit	950
water storage tank	300
PVC pipe and valve	1550
Flexible Rubber pipe	150
TOTAL COST	**7270 (INR)**

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