



## **Working Model of Pedal Operated Water Pump**

*Abhishek Parkale, Suraj Bhandare, Aditya Bodke, Ashish Bodke*

*JSPM'S Bhivrabai Sawat Institute of Technology and Research Wagholi Pune*

### **ABSTRACT**

Water plays a vital role in domestic, agricultural, and industrial settings, but ensuring its supply to different locations remains a significant challenge. Rural households and farmlands, particularly in Western Africa, face difficulties in acquiring expensive pumping devices that rely on electricity or fuel-powered motors and require specialized technical knowledge for installation and maintenance. In these areas, where electricity is unreliable and technical expertise is scarce, such pumps become ineffective. To address this issue, a Pedal Powered Water Pump (PPWP) has been developed, offering a dependable and consistent water pumping solution for general use, including small-scale industries, while also promoting physical fitness. The PPWP is manually operated and utilizes the amplified energy from pedaling to pump water from a sump up to a height of 21 feet (6.4 meters) from a depth of 11 feet (2.5 meters). It consists of a fabricated pedal and crank mechanism connected to a large rim, which, in turn, drives a small centrifugal pump pulley. The gear ratio between the pedal crank, rim's sprocket, and pump's pulley enables efficient pumping. The construction of the pedal powered water pump utilizes locally available metals and scraps, promoting recycling, generating income from waste materials, and preventing environmental littering. The machine's efficiency is determined to be 69%.

Keywords: Pedal, Centrifugal Pump, Pully, Shaft.

### **1. Introduction**

Pedal operated water pump is an eco-friendly water pump system. The pedal operated water pump works on mechanical energy without electricity. Pedal operated water pump provides drinking water and irrigation in remote areas where electricity is not available. Pedal operated water pump is not only free from pollution but also provide healthy exercise. Pedal operated water pump reduces the rising energy costs. Pedal operated water pump consists of a regenerative turbine pump operated by pedal power. The regenerative turbine pump is positioned on its stand and the driven shaft of the regenerative turbine pump is connected to the bicycle wheel. By pedaling the bicycle, the bicycle wheel rotates, thereby rotating the centrifugal pump which in turns discharges water from the sump. Pedal Operated Water Pump is works on mechanical energy without electricity. This type of pump is used to lift water in village when there no electricity or load shedding and also in rural area where there is no electricity. When pedaling is done, bicycle wheel rotates, so finally it rotates centrifugal pump which lift water from sump to 20 feet to 30 feet height. The idea of pumping water has been in existence since the evolution of man. Pumping plays a very pivotal role in the day to day existence of mankind and as a result, different methods have years ranging from man-powered operated ones down to the more efficient one.

The mechanism consists of single centrifugal pump which is fixed with the rear wheel bicycle. Paddling for just a minute for just a minute or two is enough to pump 30-40 liters of water to a height of 100 feet. Our project could prove helpful for rural areas. Which are facing load shedding problem? It can be used mainly for irrigation and water drawing water from wells and other water bodies

The idea of pumping water has been in existence since the evolution of man. Pumping plays a very pivotal role in the day to day existence of mankind and as a result, different methods have evolved over the years to pump or displace water. Water supply has been a very critical issue, mostly affecting the rural areas. Water is one of nature's most important gifts to mankind. It is one of the most essential elements to good health and as such, it should be readily available to everybody. To address this problem, different methods and techniques have been used over the years ranging from man-powered operated ones down to the more efficient one.

### **2. Literature Survey**

This paper deals with the study of development of an improved pedal powered water pump machine was undertaken with the intention of providing a simple cost solution to the problem of delivery of ground water with relatively less effort. This project analyzes the development of an improved pedal powered water pump for rural use. This development was prompted due to the need for pumping systems that does not use electricity as its power source in under developed area. The system is composed of a reciprocating pump powered by pedaling. The pedal power is being transmitted to the pump via a chain drive. Based on this design, the pump has a cylinder bore of 56cm and a speed stroke of 60 stroke/ minutes. The results of the test carried out showed that the pump discharge was 0.0016 m<sup>3</sup>/s at a head of 20m using a driving torque of 29.5 Nm with estimated efficiency of 90% which is fairly a good enough result for a pedal operated pumping system. By the use of this manually pedal powered pump we save electricity and we supply the water

in irrigation and other agricultural uses. When we drive a bicycle the wheel of bicycle are rotated so we can provide another chain over the wheel in which the sprocket is mounted on the shaft containing the rotating disc and a piston rods of the pump, the rotating disc rotate due to rotating of the wheel with rotation of sprocket . So we operate the pump and deliver the water at a particular head, create a simple and efficient way of pumping water, utilizing a human powered bicycle for communities where electricity is not available or impractical, isolated community with or without electricity in need of efficient water pumping.

The pedal operated pump can be construct using local material and skill. A water system includes a Centrifugal pump operated by pedal power. The pump stand includes a housing in which a foot pedal and a drive shaft rotate. It works on the principle of compression and sudden release of a tube by creating negative pressure in the tube and this vacuum created draws water from the sump. This bicycle pedal operated pumps water at 2-3 gallons per minute from wells and boreholes up to 23 in feet depth. Provides irrigation and drinking water where electricity is not available. They can be built using locally available materials and can be easily adapted to suit the needs of local people. They free the user from rising energy costs, can be used anywhere, produce no pollution and provide healthy exercise. Energy is the primary and most universal measure of all kind of work by human Being and nature. Everything what happen in the world in the expression of flow of energy is one of its forms. Most people use the world energy for input to their bodies or to the machines and thus about fuels and power. Energy is an important input in all sectors of counters economy. It can also be placed in garden, both gardening & cycling can do simultaneously. Operate pump near best efficiency point. Replace old pumps by energy efficient pumps.

By study of this paper in this project we find out objective of project and selection of material.

### 3. Working Principal

The working principle of pedal powered centrifugal pump basically involves three steps,

1. The first step involves the pedaling operation in as a source of energy.
2. The second step involves the running of the centrifugal pump by pedaling power.
3. The third step involves the supply of water by the pump, which runs on human power.

The pump is driven by means of human power. The power to run the motor is obtained by the pedaling operation. During this step the output will be less and there is no use of electricity whose production causes pollution. The pump is powered by pedaling operation which is obtained by harnessing human power. The efficiency and output obtained by running of the pump is mainly depend upon the speed in which the pedaling is performed and the way in which the power is transmitted through the system.



Fig- Components of pedal operated pump

### 4. Objective Of Work

From the above study done by the various researches on pedal operated water pump. It is observed that mild steel is important in fabrication. Therefore the following objectives are taken.

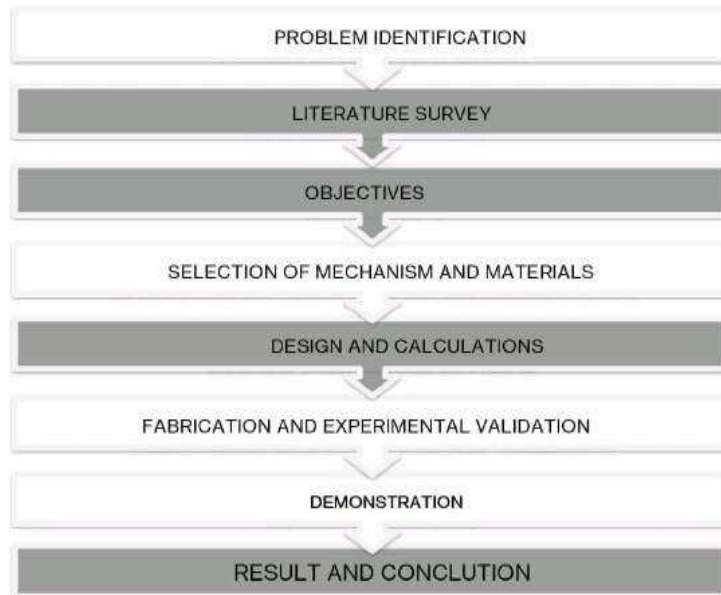
1. The first objective of this work by using pedal operated water pump we can reduce efforts required to lift water in pot from ground floor to first floor or second floor.
2. The main objective of this work is, to elimination of electricity usage in pumping of water by pedal operated water pump.

3. Pedal operated water pump provide healthy exercise.

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## 5. Methodology

After defining the main objectives to find time required for pumping water at 10 ft height without electricity. The mechanism consists of centrifugal water pump which is connected with the rear wheel of bicycle. Rear wheel is connected to shaft and finally supporting shaft is connected with an impeller through this step of paddling is used to lift water.




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## 6. Application

1. For transferring water from one place to another place.
2. For irrigation purpose
3. For gardening purpose.
4. For pesticides spraying.

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## 7. Advantage

1. It is compact and portable.
2. It is simple and rigid in construction.
3. Manufacturing cost is lesser than modern water pumping machine.
4. Power saved and good exercise for all people.
5. It uses manual power hence no fuel is required.
6. Less maintenance cost.
7. Its operation and maintenance are very simple.
8. It is compact and portable.
9. It is simple and rigid in construction.
10. Manufacturing cost is lesser than modern water pumping machine.
11. It provides better speed changes method on the driving unit.
12. Power saved and good exercise for all people.

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## 8. Reference

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