

# DESIGN AND FABRICATION OF WATER LIFTING BY SEE SAW MECHANISM

**Manisha Nagfase, Achal Bisen, Shikha Bisen , Varsha Bopche,  
Prof. Pranali Wankhade**

**Vidharbha Institute of Technology, Nagpur**

**manishanagfase11@gmail.com, varsha1999bopche@ gmail.com**

**Abstract** – This is an updated and expanded new edition (formerly Water Pumping Devices), surveying the water-lifting technologies that are available and appropriate for smallholdings. It examines the costs and general suitability of the different technologies to enable farmers and policy makers to make informed choices. More than one billion people still do not have access to safe drinking water, and almost two billion people suffer from diseases arising from contaminated water due to poor sanitation. Irrigation is essential for the basic food requirements of billions of people. The growing world population and global climate change make the challenges of providing adequate clean water, sanitation, and food ever more pressing. At the heart of effective irrigation lies the problem of lifting or pumping water. This handbook provides a detailed review of the water-lifting technologies available for irrigation, along with new information covering the provision of drinking water for humans and livestock. The book provides an overview of the entire spectrum of pumps and water lifting devices for small-scale applications and a basis for comparing and choosing between them. The main purpose is to provide a comprehensive single source of practical information for decision-makers concerned with the selection, sizing and procurement of water lifting systems and their power sources for both the supply of drinking water and for small-scale irrigation. Water Lifting Devices has long been the authority on the subject and this new third edition provides updated essential practical information for farmers, development workers, and all who need to make informed choices about water lifting technologies.

The study used the mechanical motion of playground seesaw as a means to produce pumping action. The study aimed to design a lowcost prototype energy contraption using playground seesaw using locally available and recycled materials. Pump is an innovative concept which pumps water from a bore well, a sump or a rain water harvesting tank. It uses playful energy of the children or the operators collectively to pump water. See-Saw pumps use the force lift technology to draw water from a well to an overhead tank above the ground level

for storage and distribution. It does not require electric power. See-Saw pumps work on the same technology and use the reciprocating motion to move the valves of a water cylinder. The technology below the ground is same as the hand pump technology, hence making it very easy to maintain at the village level.

**Keywords-** See pump, lifting water, pendulum, reciprocating pump.

## INTRODUCTION

We know that, our country has based on agriculture. About 70% people live in villages and that people are below poverty level. India is second largest nation in the continent of Asia. India is the biggest democracy in the world. The main occupation of people in India is farming. In India different crops are grown in different season. But the water supply for agriculture is not adequate because of irregular and insufficient rainfall. As in Vidarbha region there is a problem of electricity. The availability of the electricity is less and the utilization is more. As there is many people live in small villages and they are dependent on the farming. These people are not being able to afford the electricity and its charges. They have habit to work hard. For distribution of the water in different section of the firm, mostly pump is utilized. But as these people are in minorities these can't afford the pump as it required electricity. Also in many areas there is still electricity is not available. We people also see there is load shading arises in cities due to less availability of electricity. Many attempt had been performed by different people from different region to overcome this problem by developing hand operated pump, foot operated pump, etc.

Studying and analyzing different model our group decided to develop pump which can run by the utilization of see saw. Here we try to represent a 'CONCEPT MODEL OF SEE SAW OPERATED WATER PUMP'. Many people child enjoy the see saw. The manual power

i.e. operating the see saw by the child is transferred to the reciprocating movement of piston of pump. In this model we provide the piston pump mounted on one side of the see saw arm. The pump we here use is a “reciprocating piston pump” as this is a concept model to show that further developing pump according to model we can able to develop such a useful water lifting device and so the people who are not afford the electricity are able to utilize this product. The cost of this is more ever not exceed beyond five thousand rupees.

## METHODOLOGY

**Frame** It is the main part of the pump system and it is made up of steel. The cycle frame consists of seven rigid links which convert the pendulum movement to the piston movement. **Reciprocating Pump** This is a positive displacement pump. This is closely fitted with cylinder by the principle of actual displacement or a plunger. **Spring** Spring is an elastic object which store mechanical energy. Here, in this system both tension and compression springs are used. The function of tension and compression springs to stretch and compress according to load applied. **Lever** The motion of pendulum is transferred to lever then lever move like see –saw .the spring & piston rod is connected to the remaining side of lever due to this the oscillating motion convert in to reciprocating motion of piston in cylinder.

## WORKING OF SEE SAW PUMP

The concepts behind this see saw pump is to lift the water with the help of pendulum, which is attached to the fulcrum. The pump used in this prototype converts the oscillatory motion into the reciprocating motion, and henceforth lifts up the water up to the desired level. The pump is made of pendulum, and cylinder with the piston which pumps the water. Oscillation of the pendulum is maintained by periodical action of the human arm. Oscillation period of the pendulum is twice bigger than the period of the lever oscillation. Piston of the pump has reverse effect on the lever and damps its oscillation. Equilibrium position of the lever is horizontal, and the equilibrium position of the pendulum is vertical. Oscillation of the lever and the pendulum takes place in the same plane, vertical in reference to the ground.

The gravity effect can be created by using rotation and inertia. In this, the pendulum represents the gravity shield, such that its energy varies from horizontal to vertical axis. The work done by total vertical force acting at pivot point of the pendulum when the pendulum is at vertical axis is passed to the left side of the lever and this work is used to

increase potential energy of mass on the other side of the lever as it goes in upward direction. As the pendulum is attached to the fulcrum perpendicularly, its oscillating motion is converted into the reciprocating motion of fulcrum. Later, this reciprocating motion of fulcrum is damped by springs, which are attached to the base and fulcrum. This damping motion of springs provides reciprocating motion to the pump and hence lifts up the water.

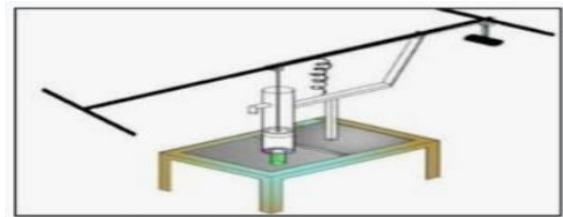
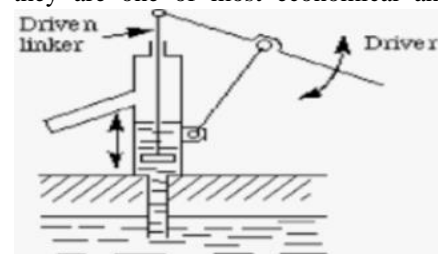


Fig showing working of pump.

The main advantage of hand water pump is to avoid human strain. It also helps us for the easy way for pumping water. The cost required to implement this is comparatively low. Hand water pump with is more efficient when compared to normal hand water pump as the water flow is high. The main advantage of this pump is that they are one of most economical and simple



solution for providing collective supply of drinking water. The main limitation is the reciprocating pump initially needs priming so it lifts water at desired level. As the design is simple the links are simple and long hence system becomes bulky. A pump requires regular maintenance which must be carried out if pump is to be use on a sustainable basis. Water pump with pendulum can be widely used in rural areas. As the installation cost of water pump with pendulum is low it is useful for poor people. It can be installed in all the public places. It can be operated by children or old people as the force required by the pump is low.

**Table 1. Technical specifications of see saw pump.**

1	Construction details	Fabricated mild steel
2	Wing span	3 m
3	Play mechanism	See Saw
4	Capacity	8-16 children
5	Ideal speed	50 strokes per minute
6	Output	1500-2000 litre per hour
7	Space Requirements	6m*1.5m minimum
8	Operating Depth	Upto 80 m depth
9	Cylinder	Direct action reciprocating cylinder of any deep well hand pump
10	Deliver head	8m
11	Weight	600 kgs
12	Riser pipes	As per users requirement

#### The see saw pump can be used for the following applications:

1. In Schools for drinking, sanitation and personal hygiene.
2. Institutions for drinking and sanitation.
3. Public garden, drinking, sanitation and watering plants.
4. Community centers for drinking and sanitation.
5. Small communities for drinking.
6. Relief camps for drinking.

#### The following are the merits of using the see saw pump:

1. Suitable for use on 100 mm and above diameter bore well sump or rainwater collector tank.

2. Can lift water up to 8 meter above ground for storage and distribution.

3. On line water purification devices can be used with either pumping or distribution system.

4. Easy to install and safe to use.

5. Low operation and maintenance cost.

6. Can be adopted with below ground assembly any deep well hand pump.

#### SCOPE OF WORK

The system, process and specifying engineers play crucial roles in determining the ultimate life cycle cost and equipment reliability by ensuring the pump is properly specified for the properties of the pumped product, the equipment's operating environment and the system's hydraulic characteristic .

#### CONCLUSION

In upcoming days the demand of energy resources will be increasing every day's the aim of this project is to develop the world by enriching by utilizing its resources more. Now time has come for using such innovative ideas and it should brought into practice. In this project the mechanism is used to lift the water from one place to another with reciprocating pump. This project is completely based on "simple pendulum". There are many sources to convert from mechanical energy to various forms. In this system no fuel or electrical energy is used. This project gives the overview for the challenges and opportunities for energy lasting in coming decades, this work can make best use of existing technology to ensure reliability and efficiency under changing condition. It outlines the need for cost effective technology in rural region. It is very useful not only in the hilly area where electricity is not available but also it is best option for farmer which are economically backward and those people who want the pump which is free from electricity. From the trials it was concluded that the water can be lifted with the less effort and human can easily operated.

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