

# PERFORMANCE OF RECIPROCATING PUMP DRIVEN BY SWING MOTION

M. Sudhagar<sup>1</sup>, N. Prakash<sup>2</sup>, Ribin Babu<sup>3</sup>, S.G. Rangis<sup>4</sup>, N. Santhosh Kumar<sup>5</sup>

<sup>1</sup>Assistant professor/Mechanical Engineering, The Kavery Engineering College, Salem, Tamilnadu

<sup>2</sup>Department of Mechanical Engineering, The Kavery Engineering College, Salem, Tamilnadu

<sup>3</sup>Department of Mechanical Engineering, The Kavery Engineering College, Salem, Tamilnadu

<sup>4</sup>Department of Mechanical Engineering, The Kavery Engineering College, Salem, Tamilnadu

<sup>5</sup>Department of Mechanical Engineering, The Kavery Engineering College, Salem, Tamilnadu

## Abstract

This paper work describes about lifting the water from some height for the irrigation, Smaller lots and small scale of agricultural purposes. In day to day life there are much more wastage of energy due to swing. we use this wastage energy for lifting the water in a reservoir and connecting with single acting reciprocating pump. Existing pendulum pump water flow happens due to the suction of water from the base by the help of dead weight placed on one end of the system and the dead weight will makes swing motion, water flow will occur. By considering the pendulum pump we analysis that the main problem in the pump is less efficiency when compared to other device and Air leakage can affect the entire working of the unit, also it may not be given a continues discharge of flow. To overcome the problems by reciprocating pump driven by swing motion . The main profit of the project gives good efficiency and better discharge at minimum swing angle. The delivery of water will dependent upon the weight of the body who makes the swing in the desired system.

**Keywords:** - Reciprocating pump, Swing motion and Mechanical properties.

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## 1. INTRODUCTION

India is a vast country based on agriculture and irrigation is the most important factor for agriculture. In India there are many sources provide for irrigation. Every day new technologies are emerged in the world which brings a revolutionary change in nature of this world. Day by day the energy resources used by the large population of this world are coming on the last stage. Today we use electricity in homes, schools for lifting or supplying water to the trees in gardens by using centrifugal pumps. But now a day's generation of electricity is the major problem that everyone is facing.

In maximum parks the swing is used for playing. This energy of swing is wastage we utilized this energy to lift the water without electricity. "Swing Water Pump" is very effective pump to lift the water without electricity. We used the mechanical energy of swing to lift the water from some height for the irrigation purpose. But used of centrifugal pump is not possible everywhere and anywhere because of load shedding problem in large area. Swing water pump refers the uses of swinging in cradle to lift the water and also provide its advantage over the centrifugal pump.

## 2. LITERATURE REVIEW

This thesis is the design of a small-scale working model of a reciprocating pump driven by swing motion.

**Mr. Manjunath C.R** ijsrd vol 13 [2015] was presently working in Asst. professor in SEA college of Engineering, Bangalore. He done convert obtained mechanical energy during the movement of seating of swing set into electrical energy along with no added effort and also storing the electricity thus generated into a battery, which can be utilized whenever needed and he takes the the output in different swing angles.

**Rony K Placid, Steffin George Sam, Amal .R** ijred vol 04 [2015] who are dept. of mechanical engineering BTTCET, Koothattukulam, Kerala which is a supplementary device for pumping water and is made to replace hand pumps. One important feature of a pump with a pendulum is that the work is alleviated or in simple terms it makes work rather easier when is compared with a traditional hand water pump. It is due to this underlined feature which enables the pendulum pump to be used as an efficient mode in the irrigation of smaller lots, water-wells and can also be used in extinguishing fires even by old people and children. By the use of pendulum based water pumping system we can increase the efficiency of the plant and reduce the effort, cost of production, production time, manpower requirement.h discussed the pendulum pump. finally they concluded that the system is practically possible.

### 3. WORKING PRINCIPLE

The system is working based on swing motion. This system is easily implemented where ever swing motion is generated. The initial step is to develop swing setup like 'cot' with required dimensions. When a child weighing below 30 kg is seated In the setup the shaft is initially engaged with the lower capacity pump (1/2 HP) with the support of roller bearing and solid link.

The length of link will dependent on the stroke length of pipe. When the child is start to swing in the cot angle will be created. The angle will also dependent upon the weight of the body. When the swing motion is developed the motion will be transfer the reciprocating pump with the help of solid link, then the water will suck from sump.

When person weighing above 30 kg is seated in the shaft is disengaged from initial position and directly coupled to the clutch placed at another end. Also the link setup will connected a higher capacity pump (more than 1/2 HP) the above procedure will repeated for higher discharge. Finally analysis the both output of the lower and higher capacity pump for future purpose.

### 4. PRINCIPLE COMPONENTS

#### 4.1 Frame

Frame will act as the supporting member on this system. Which carry all loads that acting on the entire system. Frames are made up of mild steel for cheapest cost.

#### 4.2 Solid Shaft

Solid shaft are made up of cast iron and it will helps to satisfy the swing motion on the system. Pendulum are coupled with the shaft, The movement of pendulum makes the shaft to move.

#### 4.3 Flange Coupling

It is used to hold the ball bearing and avoid the vibrations are developed in that system. It is also made by cast.

#### 4.4 Roller Bearing

Roller bearing is mainly used here for avoiding Friction in between the shaft and flange couplings. Here two roller bearings are used in the opposite direction.

#### 4.5 Reciprocating Pump

It is a positive displacement pump. It operates on the principle of actual displacement or 'pushing' of liquid by a piston or a plunger that executes a reciprocating motion in a closely fitting cylinder. Here single acting reciprocating pump is used here for pumping the water from the resources.

#### 4.6 Compression Spring

The spring is an elastic object used to store mechanical energy. Here in the pendulum pump both tension and compression springs are used. It is the function of these tension and

compression springs to stretch and compress according to the load applied.

### 5. FABRICATION OF SWING MOTION RECIPROCATING PUMP

Steps of fabrication of pendulum based water pump are as follows:

1. Collecting the required raw materials.
2. Cutting the metal bars to required size.
3. Fabrication of frame as per the design by utilizing the metallic bars.
4. Fixing of reciprocating pump to the frame.
5. Placing the shaft at the correct position.
6. Attaching the crank into an both end of the shaft.
7. Analysis both theoretical and practical values.

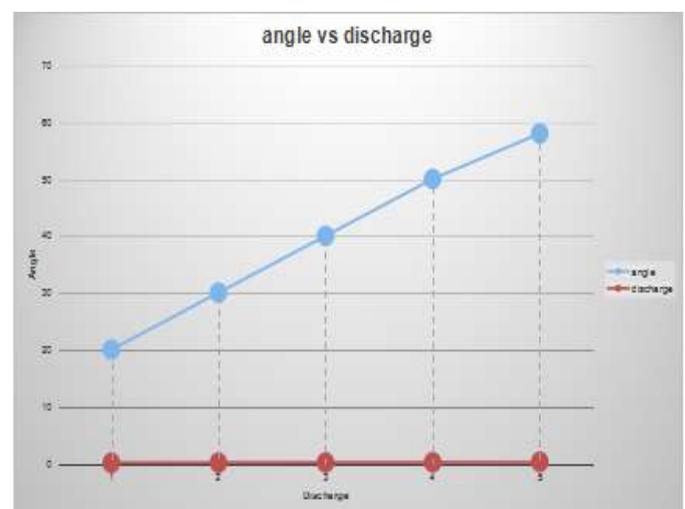
### 6. RESULT AND ANALYSIS

The various parameters that determine the output discharge of the reciprocating pump driven by swing motion are analyzed and results are plotted. Analyzes parameters include stroke length, Swing angle and displacement of pendulum.

#### 6.1 Table of Calculation

S.NO	Angle(deg)	Stroke length(mm)	Discharge (lit/stroke)
1	20	41.2	0.122
2	30	61.5	0.152
3	40	76.5	0.174
4	50	98.18	0.200
5	58	120	0.286

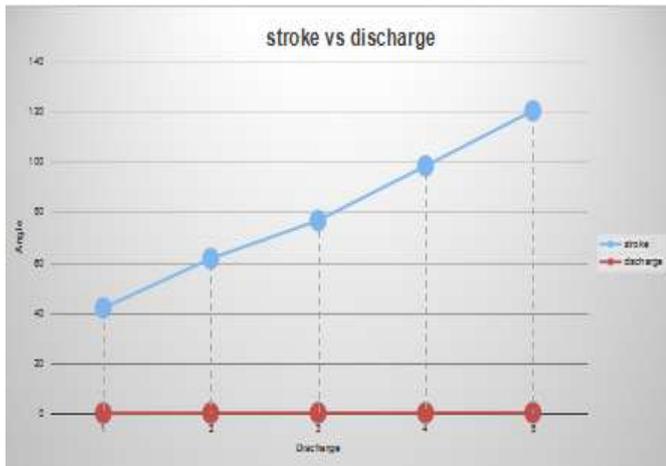
#### 6.1.1 Analysis of Swing Angle of System



### Angle vs discharge

Graph 1: Swing angle ( $\theta$ ) Vs Discharge (lit/stroke)

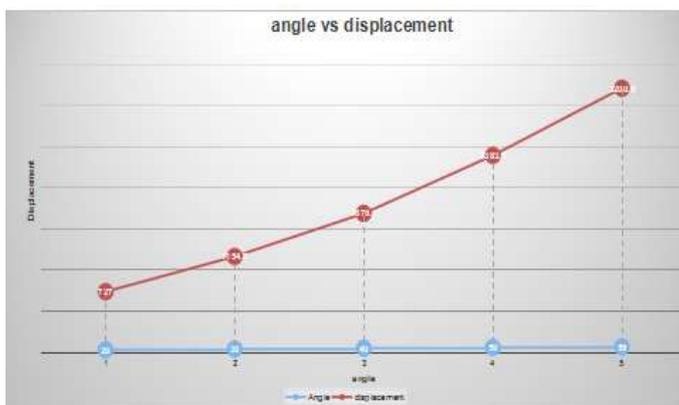
### 6.1.2 Analysis of Stroke Length



### stroke vs discharge

Graph 2: stroke length (mm) Vs Discharge (lit/stroke)

### 6.3 Analysis of Swing Angle with Displacement



### Angle vs displacement

Graph 3: Swing angle ( $\theta$ ) Vs Displacement (mm)

## 7. CAD MODEL

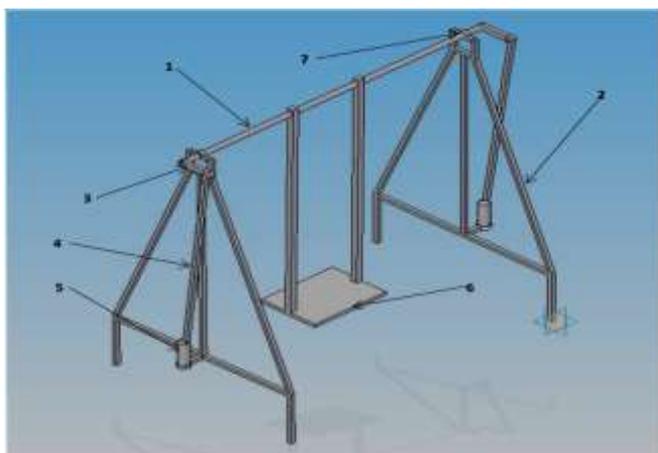


Fig 1: CAD model of proposed system

## 7.1 Parts

1. Solid shaft
2. Frame
3. Bearing Setup
4. Connecting rod
5. Reciprocating pump
6. Sitting plate
7. Flange coupling

## 8. APPLICATION

It can be used as follows;

- Parks
- Children play grounds
- Other public gardens
- Household purposes.

## 9. FUTURE SCOPE

- a) It can be used for where the electricity problem occurs.
- b) This system is more efficient compared to the other existing models.
- c) It can be used various pump with high capacity and analysis the various discharge for each pump while considering the parameters like mass of body, Swing angle etc.,
- d) It can be varied the length of the cot will get more efficient output.
- e) We can implement this system with existing system with low cost.

## 10. CONCLUSION

This paper based on swing motion system is defined as a difference between the resulting energy of single acting reciprocating pump and the energy input from human to the swing same time interval. Existence of the swing energy defined in this way is not in accordance with the energy conservation law, but it has been verified experimentally and it can be explained.

The major advantages of this system is to avoiding external sources to driven the pump. It also helps us to pump the water in easiest way. The cost required to implement this experiment are comparatively low. In future, we can execute the system in parks, schools and public gardens etc. As the installation cost of this system is low and it is useful for saving the electrical energy.

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