

Experimental Study on Water Lifting Simple Pendulum Mechanism for Borewell using Solar Energy

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Abstract: In India in many region the water is obtained through bore well. In this by using bore well pump and hand pump we can lift the water from underground. Hand pumps are manually operated pumps; they use human power and mechanical advantage to move fluids or air from one place to another. They are widely used in every country in the world for a variety of industrial, marine, irrigation and leisure activities. In this project we have tried to reduce / eliminate the problem present in the conventional hand pump by using simple pendulum m. This innovation/modification we can use for rural areas, villages where most of the time the peoples they waste time for to bring or to obtain water.

Keywords: Hand pump , solar panel , flywheel , simple pendulum mechanism

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I. Introduction

A hand pump is a simple device that uses human power and mechanical advantage to move ground water to the surface. Most of hand pumps have reciprocating pistons and are positive displacement type pumps. The main advantage of hand pumps is that they are one of the most economical and simple solutions for providing a collective supply of drinking water in rural areas and suburban environments. They also help to eliminate the risks of people and children in particular areas are falling into open wells. Groundwater identification is one of the important stage in construction of a borewell. Although there is no direct method of identification of hidden groundwater, there are certain scientific methods which are producing highest accuracy of more than 95% success in identification of perfect station to drill a borewell. A good hand pump can access a sufficient quantity of quality safe water in accordance with sphere guidelines and has a well-constructed platform or apron that permits water to drain safely and rapidly to prevent public health issues and also hasprotection from contamination. This can easily be maintained and repaired.

II. Literature Review:

1 A low-frequency pendulum mechanism.

In this literature Dr. James Parks author given the basic A pendulum mechanism is presented whose natural frequency of oscillation is distinctly lower than that of a conventional pendulum of comparable size. Furthermore, its natural frequency is approximately proportional to its amplitude of oscillation. The mechanism can thus be tuned to extremely low frequencies by using small amplitudes. The undamped free oscillation response of the mechanism is studied. The derivation of the equation of motion is outlined for both large and, after neglecting higher order terms, small displacements. In both cases, a second-order nonlinear differential equation results. When higher order terms are neglected, the equation of motion is of simple form and can be solved symbolically in terms of a Jacobi elliptic function. Based on this solution, a closed-form expression for the natural frequency is derived and the characteristics of the free oscillation response are discussed..

2 Hand Pump and Sanitation Facilities

The purpose of this manual is Hand Pump and Sanitation Design.Manual is a result of the Humanitarian Response to the August 2008 conflict in Central Mindanao. An ongoing response, we have so far faced many issues surrounding the act of responding to long-term displacements. One issue for example, is that it took partners some time to come up with suitable designs and bills of materials, which in turn delayed the implementation of expected infrastructure. This manual illustrates some basic water and sanitation implementations, and details basic requirements and possible interventions which will provide a starting point

for the user. Engineers from Oxfam-GB Philippines, Kadtuntaya Foundation Inc., Mindanao Tulong Bakwit, and A Single Drop for Safe Water worked together in the implementation of the water and sanitation interventions included here. They then worked together, brainstormed, and went through a review process with the goal of documenting this information for use of their respective agencies. This was also meant for the use of other stakeholders, not only in Central Mindanao but in other areas where effective Humanitarian Response is required.

3 Operation and maintenance manual for rural water supplies.

In this literature emphasize given on, The objective of an efficient operation and maintenance of a water supply system is to provide safe drinking water as per designed quality and quantity, with adequate pressure at convenient location and time at competitive cost on a sustainable basis “Operation refers to timely and daily operation of the components of a Water Supply system such as headwork’s, treatment plant, machinery and equipment, conveying mains, service reservoirs and distribution system etc., effectively by various technical personnel, as a routine function.” “Maintenance is defined as the act of keeping the structures, plants, machinery and equipment and other facilities in an optimum working order. Maintenance includes preventive /routine maintenance and also breakdown maintenance. However, replacements, correction of defects etc. are considered as actions excluded from preventive maintenance

4 The Simple Pendulum.

In this paper the author has discussed about, the purposes of this experiment are: (a) to study the motion of a simple pendulum, (b) to study simple harmonic motion, (c) to learn the definitions of period, frequency, and amplitude, (d) to learn the relationships between the period, frequency, amplitude and length of a simple pendulum and (e) to determine the acceleration due to gravity using the theory, results, and analysis of this experiment. A simple pendulum may be described ideally as a point mass suspended by a massless string from some point about which it is allowed to swing back and forth in a plane. A simple pendulum can be approximated by a small metal sphere which has a small radius and a large mass when compared relatively to the length and mass of the light string from which it is suspended. If a pendulum is set in motion so that it swings back and forth, its motion will be periodic.

Objectives:

- a. To eliminate the manual efforts required for pumping of water.
- b. To reduce the time required for pumping of water.
- c. To reduce the risk of injury and human physical problems.
- d. To standardize the process and reduce interfere of human.

III. Methodology:

Design and development of water lifting for borewell through simple pendulum mechanism

Specification of proposed waterlifting for borewell through simple pendulum mechanism

These machines are small enough to operate manually.

1. Function: Lift the underground water without human effort.

2. Specification:

I. Type:Motor operated

ii. Power: -PMDC motor solar operated.

iii. Man power requirement: -One labor / person unskilled.

iv. Overall dimensions (Tentative):1200x1200x 1500 mm

v. Capacity:5 liter per 3min.

Vii: -speed capacity: -Variable or adjustable as per requirement.

vii. General Information:

The machine consists of a set up of hand pump and structural frame for it. In this set up we are going to design and develop a new mechanism which help or assist to borewell for lifting of water.

In this we are also trying to design a linkage mechanism which will perform the borewell water lifting smoothly.

3. Analysis of different critical parts of mechanism.

4. Selection of materials and drives.

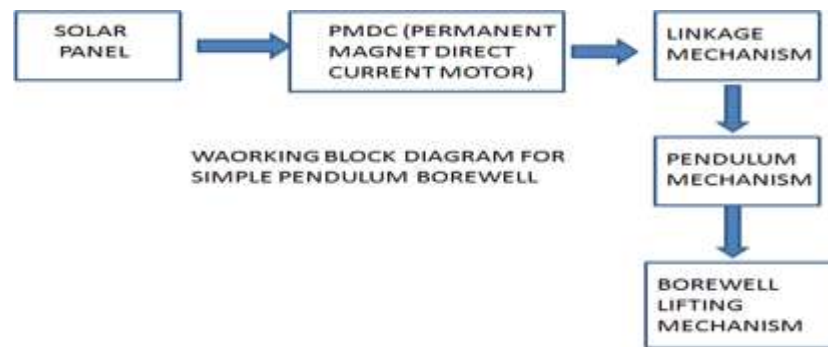


Fig: - Working block diagram of simple pendulum borewell

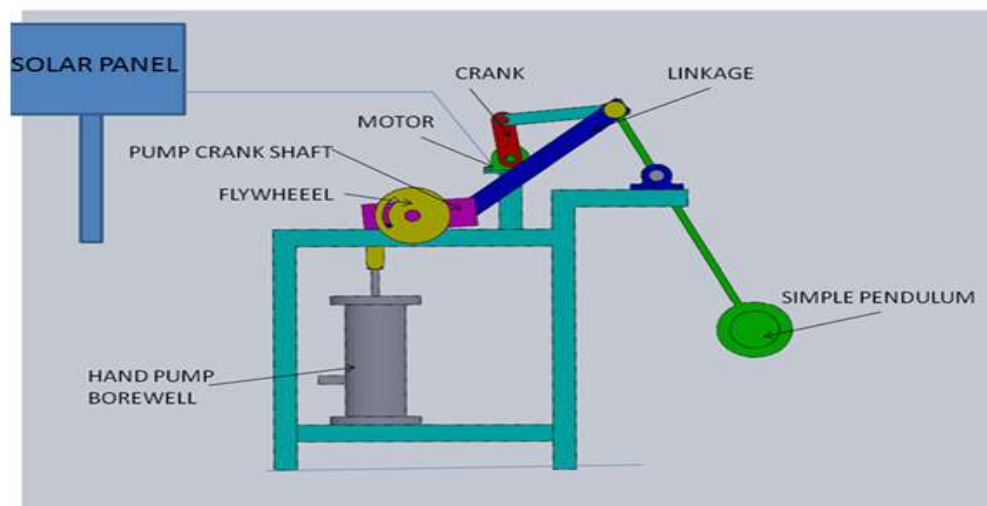


Fig:Proposed simple pendulum borewell

The arrangement shown of schematic diagram of machine, in which we have shown arrangement of different parts. In this project work we have used the inertia advantage which we get from simple pendulum mechanism as shown in fig. By using linkage shown we can able to operate the simple pendulum through solar operated PMDC (permanent magnet direct current) motor. For simplicity we haven't shown the battery and solar panel in above diagram

CONCLUSION: Because of using Simple Pendulum Operating on Solar Energy in hand pump, manual work will be reduce.

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