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STUDY OF WIND MILL WATER PUMP

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ABSTRACT

This project is a combination of mechanical engineering and sustainable development in developing countries. The goal has been to build a windmill driven water pump and to design a small-scale irrigation system. The purpose behind that is to spread knowledge about these techniques to farmers in the region.

Developing country like India has to be develop new way to energy resources for various processes for the betterment of developing in the view of cost, efficiency, performance & other aspects.

The windmill construction in this report is based on the prototype, but the original drawings were changed to fit the specific situation in according region better. Important throughout the project has been to minimize cost and to only use material that local farmers can get hold of. Building and assembling of the windmill were then performed by the authors in co-operation with local workers. The windmill drives a pump that pumps water from a well to a tank for further use in irrigation.

Calculations has to be make on the energy available in the wind and an energy analysis will be then performed to see what wind speed is required for the system to work. If wind flow speed is low, the windmill can be adjusted by placing the connecting rod closer to the rotation centre where it requires less work to function. As a result of that, the volume of water per stroke will decrease and it will take longer time to fill the tank. This project will commence when there is less wind; therefore the windmill will not be tested during optimal wind speed conditions.

Keywords- energy savin , pump , water reservoir ,wind , wind mill.

I. INTRODUCTION

We can save money and help to reducing air pollution by using renewable energy sources such as solar or wind power for our home, for drip irrigation or for livestock water wells. Wind and solar energy can be excellent options in remote areas where the costs of extending transmission lines are high. Renewable energy sources are also a good option when only a small amount of water needs to be pumped. Generally, less quantity of water is required for livestock and home usage.

Wind is often used as an energy source to operate pumps and supply water to livestock. Because of the large amount of water needed for crops in land, wind power is rarely used for irrigation. As larger and/or more efficient wind turbines are developed, groups of these wind turbines (or single wind turbines) are expected to be able to generate enough electricity to be used for irrigation projects. Water supplies such as wells and dugouts can often be developed on the open range.

1.1 Problem Statement

A) Required a suitable location to build the windmill. As well as wind conditions and water sources & security aspects.

B) Designing of the windmill suitable for transport of water from the chosen water source to a tank.

C) Build the windmill according to the adapted drawings.

D) Planning of a simple and economical irrigation system.

E) availability of material to make construction easier to support the local economy

1.2 Objective

The real mean for this project are simple and cost-effective, so that it will be possible for local farmers to use the techniques on their own farms. The goal of this project is to build a windmill driven water pump that can pump water from a nearby source to a tank. The purpose is to enable to demonstrate and spread knowledge about wind-powered water pump technique to farmers in the ruler region.

II. PREVIOUS WORK

Wind machines have been used since ancient times to drive machines to pump water in many areas of the world. Early wind pumps Persia and China were of the vertical axis type and it is thought the technology arrived in Europe from the eleventh century onwards. The traditional European wooden wind machine with four sails or blades first appeared in the twelfth century and was widely established by the seventeenth century to pump water in the Low Countries.

Technical developments were driven in the nineteenth century, by the European colonisation of North America, where wind pumps for cattle farms, and water tanks for the transcontinental railways were in great demand until recently the multi-bladed wind pump on a steel lattice tower was a common sight in USA and it is still the model for machines being manufactured today. Historically the multi-blade American wind pump was considered as the panacea for water pumping. It is an old technology developed on a trial and error basis between 1850 and 1930, which can boast on a proven reliability. Over a million are still in use in Argentina, South Africa, USA, Australia, etc.

In India, with full government support, there are now over 2000 modern wind pumps used mainly for irrigation but also for village water supply and pumping seawater for salt production. It is estimated that throughout the world they are over one million wind pumps in operation. Poor quality drinking water is the causes of more than half of human sickness in the developing world. The provision of pumped clean water is one of the best ways to improve health and increase the productive capacity of the population.

The original impetus to develop wind energy in India came in the early 1980s from the government, when the Commission for Additional Sources of Energy CASE had been set up in 1981 and upgraded to the Department of Non-Conventional Energy Sources DNES in 1982.34 This was followed in 1992 by the establishment of a full-fledged Ministry of Non-Conventional Energy Sources MNES, renamed as Ministry of New and Renewable Energy MNRE in 2006. The Indian Renewable Energy Development Agency IREDA was established in 1987 as a financial arm of the Ministry to promote renewable energy technologies in the country. It provides finances to manufacturers, consultancy services to entrepreneurs, and also assists in the development and upgradation of technologies

Ruler access to clean water is best achieved through pumping from underground water aquifers rather than using surface water sources, which are often polluted. Because of the relatively small quantities of water required, wind pumping for village supply and livestock watering can is cost-effective given a good wind site. Irrigation pumping however requires large quantities of water at specific times of the year. For much of the year the pump may be idle or oversized and wind pumping for irrigation may be more difficult to justify on economic grounds. Wind pumps have been preceding in Sudan since the 1950s for the purposes of pumping water, for drinking, and irrigation in remote desert areas-Gezira region, the Red sea hills along the main Nile north of Khartoum down to Wadi Halfa. These wind machines are of the Southern Cross types and suffered from several problems.

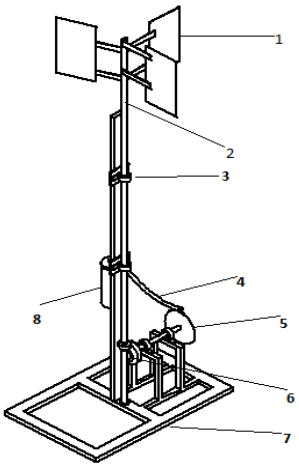
III. STRUCTURE

In this project blades are arranged on the vertical axis and are rotated by wind When blades are rotated & generate power. This power is transmitted by tower for the different uses. A windmill converts the kinetic energy of the wind into mechanical power.

This power drives an underground pump which lifts groundwater to the surface where it can be stored and used. A reciprocating piston-type pump is a simple construction. It consists of a cylinder pipe with a piston inside..When mechanical work is exerted on the connecting rod the piston moves up and down .The amount of water a wind-powered water pumping system can deliver depends on the speed and duration of the wind, the size and efficiency of the rotor, the efficiency of the pump being used, and how far the water has to be lift.

In this project three blades are connected with rotor, when rotor rotated by wind, the power is transmitted from shaft to bevel gear. Main purpose of this bevel gear to transmitted power from shaft to reciprocating pump. Handle of reciprocating pump is attached with cam to take power from bevel gear. Reciprocating pump a piston pump, the piston is fitted with a non-return valve (the piston valve) and slides vertically up and down within a cylinder that is also fitted with a non-return valve (the foot valve).

Raising and lowering the handle of the pump causes vertical movement of pump rods that are connected to the piston



1) Blade,2) Solid Shaft,3) Pillow Block Bearing,4) Handle Of Reciprocating Pump,5) Camp,
6) Bevel Gear,7) Base,8) Reciprocating Pump.

IV. CALCULATION PART

1) Torque Extracted, $T = \frac{1\pi l}{2}$ (Nm)

Where,

R = Rotor radius (m)

V = Wind speed (m/s)

Cp = Power coefficient

= Tip speed ratio

2) Water power required, $P = \varrho\, g\, Q\, H$ (watts)

Where,

ϱ=density of water kg/m^3

g=gravity (m/s^2)

Q- Flow rate (m^3/s)

H - Total Pumping head in meters of water

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