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Review on Experimental Set Up of Drip Irrigation by Using Wind Energy

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Abstract: India is a developing country due to which India is far behind in the automation and sophistication in the agricultural field. Due to this our production rate of agriculture decreases. So, for the automation we connect to the electronic field to the agriculture field. Drip irrigation means "Supply of water to the root zone by mainlines as well as supply lines for the consumption of water". Drip irrigation system is originates from Israel. Where there is low amount of water for cultivation. The people in Israel have developed this technique. Due to its optimality this technique is fast spread in all over the world. The renewable energy resources are best alternatives when the less amount of water is required to pumping as well as drip irrigation. Generally less amount of water is needed to livestock and domestic use to the survival of human being. The wind energy can be used in the mechanical form by means of wind mill. Wind mill can convert the wind energy into mechanical energy.

Keywords: *Wind Mill, Connecting Pin, Connecting Rod, Pump etc.*

I. INTRODUCTION

Wind and solar energy are best alternatives in remote areas where the costs of transmission lines are high. Renewable energy sources are best alternatives when only a small amount of water needs to be pumped. Generally, Low amount of water is essential for livestock and domestic use. Wind energy is used as an energy source to run the pumps and supply water to livestock. Because of more amount of water needed for agriculture, wind power is used for drip irrigation. As more efficient wind turbines are developed, groups of these wind turbines are expected to be able to produce electricity to be used for irrigation application [1].

Windmill is a device which is used to converting kinetic energy into mechanical energy. The major element of a windmill is the rotor. Assembly which consist metal blades attached to spokes radiating outward from a hub. The hub is mounted on a shaft which is capable of rotating on bearings. The power developed is directly proportional to the swept area by the blades and the cube of the wind velocity.

The shaft power is transmitted to the pump in number of ways. In that reciprocating pump is used, rotary motion of the shaft is converted into reciprocating motion .A crank mechanism is used here for pumping of water. If a rotary pump is used, a connecting rod is used to connect a pulley mounted on the windmill shaft to a pulley on the pump shaft this vane intercepts the changing wind direction and orients the rotor to face the wind. Horizontal axis windmills having a large number of blades have a high starting torque and are used to water pumping applications. A positive displacement type of pump is used to which a measured quantity of water is sucked in a space, its pressure is increases and then it is supplied to the drip irrigation. Horizontal axis wind mills are facing the wind to obtain the maximum power.

Dripper is attached inside and pipe gives precise amount of water to the root zone. Due to which we gives required amount of water to the root zone. The fungi also affect to the plant in growth as well as production and due to large amount of water the growth of fungi increases rapidly due to this the plant growth and production rate decreases. So, to avoid the fungi affect this technique plays important role in agricultural field.

Wind energy is main source of renewable energy that can be exploited for pumping water in remote areas, and windmills is oldest methods of converting the energy of the wind to pump water. The primary consideration in selecting a site for a windmill is whether there is sufficient wind is available to operate such a device. Air-lift pumps can lift water at rates between 20 to 2000 gallons per minute, up to about 750 feet. The discharge pipe must be taken in the deep into the water, from 70% of the height of the pipe above the water level down to 40 percent for higher lifts.

Water is the primary source of life to animals. The rural demand for water for irrigation and domestic use increases in society. The groundwater level is decreasing, which makes traditional hand Pumping and bucketing difficult. The farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals.

II. LITERATURE REVIEW

Yandra Shivrath, P. Badari Narayana, Srikanth Thirumalasetty, Dr.E.Laxmi Narsaiah investigates the requirement of water pumping they selected the submersible pump according to the selection criteria such as source of water, required pumping rate, total suction head, total dynamic head. Solar-wind hybrid system is an optimum economic solution for which saves the electricity bill. Also saves the money wasted in power lines installation. This system is nonpolluting source of electricity. And also gives the optimization in cost to fullfill the requirement of water in drip irrigation. Due to hybrid system of solar-wind hybrid system the output achieved in all the time. Hence the efficiency of the system increases and also reliability also increases. The

accesses electricity from a battery source is useful in domestic as well as other requirement [2].

Maren I. Borok, Gyang Y. Pam, Kolo B. Yetu searched the various materials, method and designs of windmill and the pump in his paper. They considered some parameters like wind power potential, reference area, pump size, diesel engine size, Gear design, Shaft design, cost of diesel fuel is required to operate the device. The wind-diesel water pumping system consists of windmill, diesel engine and reciprocating pump. These devices are selected according to the standard criteria. For the reliable water supply these component are designed according to their sizing. The wind pump is selected in such a way that it will operate in both condition i.e. in wind and diesel engine. This system reduces the amount of greenhouse gases emission and cost of operation also reduces by saving fuel [3].

Archana Thorat, Rohini Pore, Madhuri Arbune, V.R.Gosavi, A.K.Deshmane investigates the drip irrigation system according to an electronic devices like micro-controller, sensors, wind mill and water pump etc. The efficient system will be developed this system is inexpensive because electricity, manpower eliminates. This system is user friendly system because this system has easy use, maintenance is easy and construction also easy. This device has a great evolution in drip irrigation system. They use wind energy to creation of required amount of electricity to operating of a micro-controller and sensor and water pump. This system eliminates wastage of water as well as water pollution, .By using the probes and mechanical pressure sensor for water level and soil conductivity the cost of the system reduces as compared to the other systems [4].

Prasad S.S., Virupaxi Auradi Determines the electrical connectivity of rural India isn't good. Also in that transmission and distribution losses are significant. An effort has been produced in this paper to optimize the rotor of wind pump for achieve more efficiency. This work can be measured renewable energy applications rather than mixing up to grid capacity. While there is no doubt that wind energy has more potential to mix up to the gird capacity of our country it also presents a more potential for direct conversion to required usable energy. So it is imperative upon us the engineering Community that we innovate new ways to convert renewable energy to required usable form and determine ways to benefit the end user directly with energy available locally in their community [5].

Nguyen Thanh Nghi, Helen F. Gavino and Manuel Jose C. Regalado Determines the wind is a free renewable energy source and its use is environmentally no polluted. By using the wind pump drip irrigation system, water requirement of crops would be supplied not using by fossil fuel. The total water supply from the wind pump and rainfall varied in a year because of the fluctuating wind speed and rainfall. At the same level of wind speed, the discharge of the suction pump was higher than that of the piston pump because the former has bigger suction diameter than the latter. Thus, the efficiency of the suction pump combined with the windmill was higher than that of the piston pump. The investment on the wind pump-drip irrigation system is feasible if high value crops, such as tomato, are selected. Results of the study and observations made during the test period, recommendations for further study are as follows:

1. The tail vane structure of the windmill should be redesigned so that the rotor will skip strong wind. Observation showed that the system worked well with maximum rotor speed of 50 rpm.
2. Based on result of optimization, to store surplus water from irrigation for household use, system should be matched with water tank that has capacity of 4.5 m3 corresponding to about 25 200-liter oil drums.
3. Economic evaluation of using the system should be continuously studied for other high value crops, such as chili and bitter gourd, both during wet and dry seasons [6].

Anurag Mehta, Ridima Srivastava, Virendra Kumar Yadav, Pushparaj Singh investigates the completely electronic and mechanical model of drip irrigation which operates automatically by using wind energy. Such system used an electronic devices like a microcontroller, sensor, relay and voltage generator and windmill, water pump, valves are the mechanical devices etc. they used a AVR studio 4 software for drive the motor. Such system is inexpensive about the electricity, manpower and water requirement. It gives higher efficiency. The proper voltage is generated to operate the microcontroller, sensor, relays and motor. Such system reduces the excess water quantity by using the water level sensor. The water pollution is minimized due to management of water by using water level sensors. The salinity problems also eliminates by using such a system [7].

Kobok P. Aguko, D.M. Nyaanga, J.O.Onyando C. searched the wind pump drip irrigation system. By using design charts the system is evaluated on the basis of performance. And due to these charts the time and irrigation time will be determined accurately. The wind pump drip irrigation also depends on the survey of the land. In survey we need to the evaluate the depth of irrigation and area of irrigation. Also evaluates the discharge of water per hour, discharge of water per day, discharge of water per month, discharge of water per annum etc. by observing some parameters they calculate the discharge according to the speed of wind and discharge equation. Also designed the charts of wind speed verses discharge and other charts. By using this charts the irrigation depth and area will be determined [8].

Ion Bostan, Valeriu Dulgheru, Ion Sobor, Viorel Bostan, Anatol SOCHIREANU investigates the development, manufacture and testing for horizontal axis wind microturbine of power 10 Kw. They can state that the direct connection takes place between the rotor may

be designed in such a way that rotor at start up at low wind speed creates a large amount of energy. It gives the less maintenance as compared to the turbine multiplier conditions [9].

III. SYSTEM OVERVIEW

A. Power Transmission Block Diagram

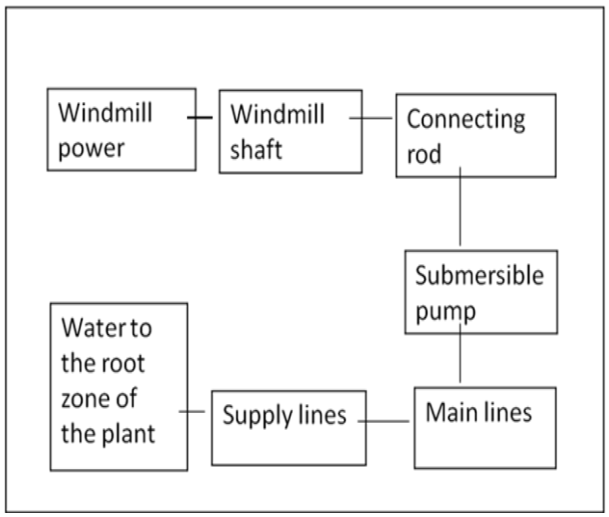

Figure 1: Power Transmission of wind energy

B. Windmill

The early windmills looked like large fan. Centuries later, the people in Holland improved the windmill. They gave it propeller type blades and made it so it could be turned to face the wind. They have been used for pumping water or grinding grain. Holland becomes one of the world's most industrialized countries by the 17th century which use the first windmills. Windmills work because they slow down the speed of the wind. The wind flows over the airfoil shaped blades causing lift, like the effect on airplane blades, causing them to turn. The blades are connected to a drive shaft that turns to transmit the power to the pump.

Here we use a four blade windmill as per the requirement of our project. Wind mill is a device which can convert the kinetic energy of the wind to the rotary mechanical energy.

C. Shaft

Shaft is the main part of power transmission as well as balancing of windmill. The shaft design is given as follows:

The power transmitted by a shaft at a given rotation of windmill is given as,

$$P_{sp} = T_s \times \omega_s$$

For shaft subjected to only twisting moment such as,

$$T = (\pi / 16) \times \tau \times d^3$$

D. Connecting Rod

Connecting rod is a long thick bar which connects the windmill shaft and the pump. This transmits the power to lift the water inside the borehole. Length of connecting rod is kept according to power transmission.

E. Submersible Pump

The pump is the important part of the drip irrigation system. The pump is the major component of the drip irrigation by using wind mill. The rotary motion of the windmill shaft is converted into the reciprocating motion by using connecting rod. By using this motion water is lifted from the water source and sends to the supply lines.

F. Advantages

- The system is completely noise free.
- The initial cost is low.
- The maintenance cost is low.
- The construction is simple.
- No requirement of skilled labour to operate this system.
- It saves lot of money and time.

G. Application

- This system used in farm.
- This system used in the play grounds lawn.

CONCLUSION

Conventional drip irrigation system are not too ecofriendly and pollution free system. From above literature review it is conclude that if a connecting rod is used in between the windmill shaft and pump for transmission of power, than the cost of system reduces. Also it doesn't require battery, microcontroller and sensor. The construction and operation of such system is simplicity in the handling and operating device. Such device can be made by using principle of slider crank mechanism.

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