

# Review on Water Pumping using Wind Energy

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**Abstract:** *This is the right time to think about renewable energy sources to use the day to day requirement for wind pumping, power production, grinding grains, and some other purpose because of conventional energy forms are getting depleted by one by one, so we have to move to renewable energy sources. Wind power used earlier for propelling ship, driving wind mill etc. In this review study, the various water pumping methods using wind energy were discussed.*

**Keywords:** Water Pumping, Water lifting technology, Wind Energy, Wind Mill, Wind Turbine

## 1. Introduction

Water has always been a primary human need; probably the first consideration for any community has always been their need for ready access to it. Irrigation water more specifically can offer important benefits like increases the land area brought under cultivation, allows greater cropping intensity, produces improved economic security for the farmer. There are many different types of human and animal powered water lift machines are available. Wind energy can be harnessed to meet the requirements of drinking water and minor & small - scale irrigation in rural and remote areas. Now the wind pump uses modern design method and

material to combine the excellent performance with ease of manufacture, low maintenance and high reliability.

### 1.1 Water Lift Technology

Lot of methods and devices are used to lift the water. In earlier days, people designed the method according to the usage. The scoop, swing basket, scoop with rope support, counter poise lift, leather bag, Circular mohte utilizing two buckets with flap - valves and Bullock driven Persian wheel methods were used to lift the water for irrigation purpose [1] [3]. Initially human power, then animal power also used to lift the water. After invention of electricity, electric driven pumps were used to lift the water.

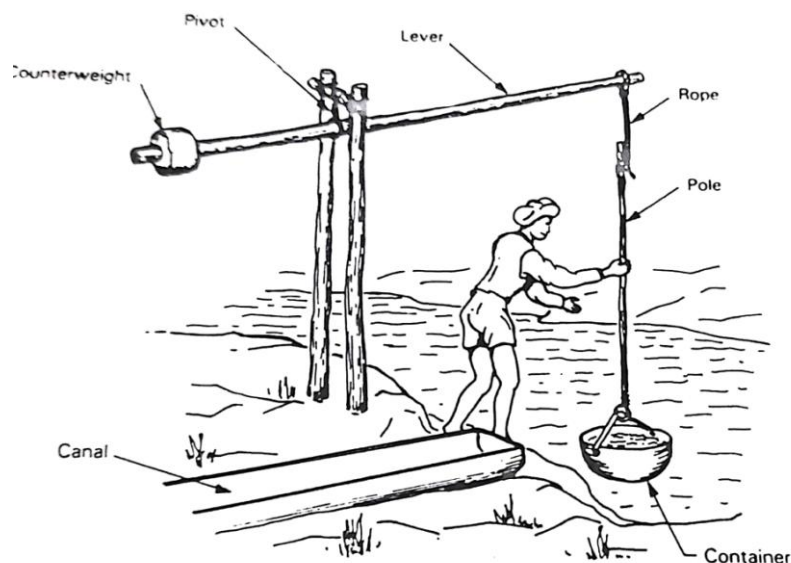


Figure 1: Counterpoise Lift [3]

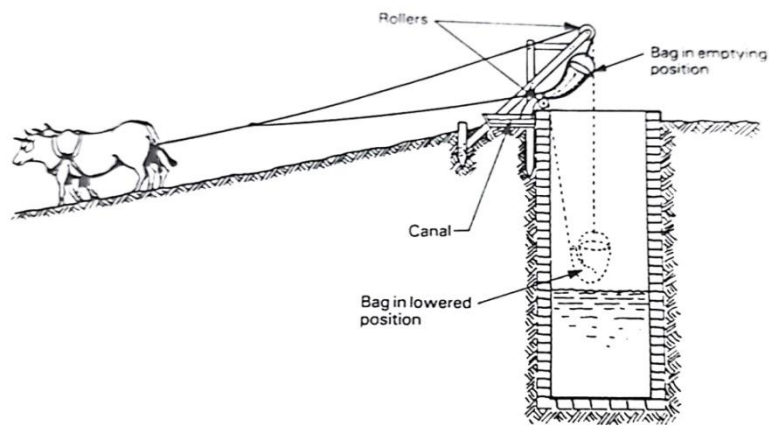


Figure 2: Self –emptying mohte with inclined tow path [3]

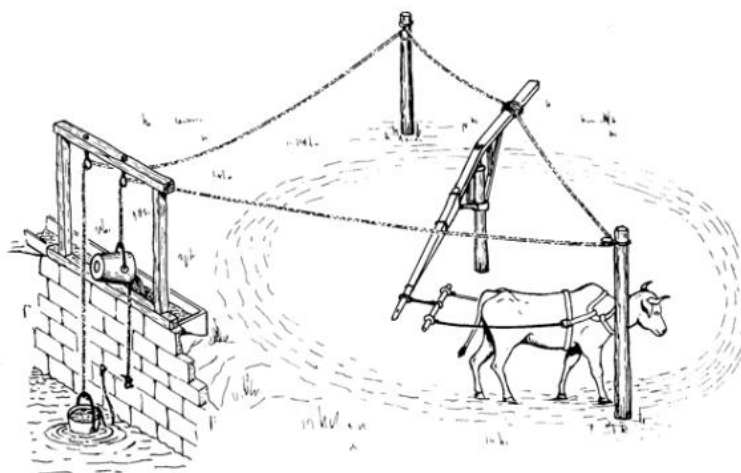


Figure 3: Circular Mohte utilizing two buckets with flap - valves in bottom [3]

## 1.2 Wind Energy

Wind is the air in motion; Energy in the wind is converted into mechanical (rotary) energy by the wind turbine. The mechanical energy is used for several applications such as pumping water, grinding grains [5] [8]. Winds are the natural phenomena in the atmosphere and have two different origins. One is planetary wind, these are caused by the daily rotating of earth around its polar axis and unequal temperatures between polar regions and equatorial regions, another one is local winds, these are created due to unequal heating and cooling of ground surfaces and ocean/lake surface cause local winds during day and night.

## 1.3 Wind Energy for Water Pumping:

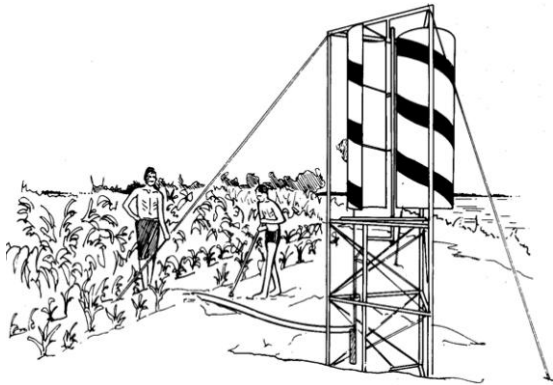
Wind energy is converted into mechanical energy, and then it is used for water pumping. The Wooden indigenous wind mill pump, Chinese chain windmill, Cretan type of windmill [2], Savonius vertical axis wind pump were used to lift the water with the help of wind energy.



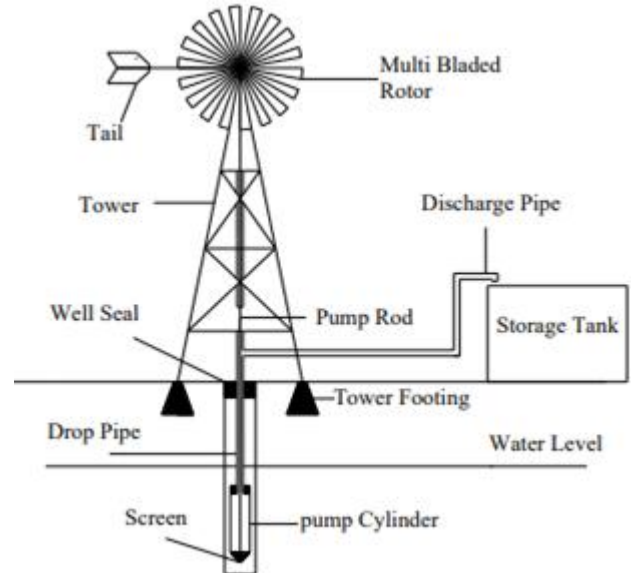
Figure 4: Cretan type of windmill used in Ethiopia [3]

In above windmills those give the reciprocation motion to the pump to pump the water. Mostly the reciprocation pumps were used to pump the water. These pumps require

longer connecting rod from the wind mill to actuate the piston. Some savonius rotor vertical axis wind pumps were used for water lift for irrigation. Traditional windmills were used extensively in the Middle Ages to mill grain and lift water for land drainage and watering cattle. These wind energy converters are still used for these purposes today in some parts of the world.

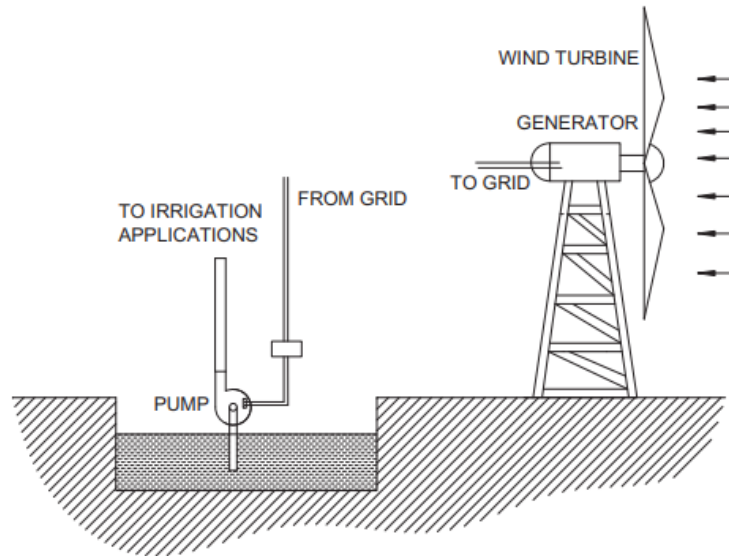


**Figure 5:** Savonius Rotor vertical axis wind pump used in Ethiopia [3]



**Figure 6:** Schematic diagram of windmill water pumping system [7]

The present day water pumping system is illustrated in the figure 6. Presently, using wind turbine generates electricity, that electrical energy is used to pump the water using centrifugal pumps or submersible pumps. Wind turbine is a machine for converting the mechanical energy in the wind into electricity [4] [9]. Solar –wind hybrid system also used for water pumping systems [6].



**Figure 7:** Layout of Wind Energy based water pumping system [6]

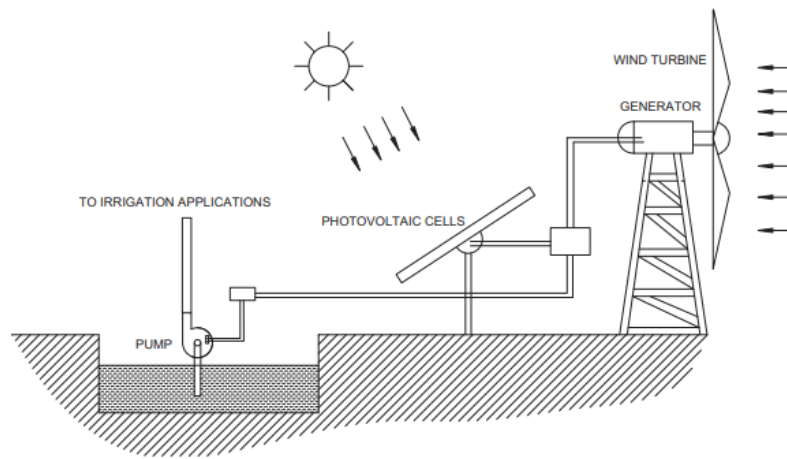


Figure 8: Layout of hybrid (Solar and Wind) energy source water pumping [6]

## 2. Conclusion

Wind energy is one of the renewable energy sources. In earlier days, people used the human power and animal power used to lift the water for drinking and irrigation purpose. Due to development, various mechanical equipments were used along with human power for water pumping. Wind energy mainly converted in to direct mechanical energy in wind mills and converted in to electrical energy in wind turbine. With the help of direct mechanical energy conversion, it is used to run the reciprocating pump to lift the water. Using electric energy from wind turbine is used to give power supply for centrifugal pump or submergible pumps. With the help of hybrid systems using both solar and wind energy, the electric operated water pumps got energy and lift the water.

Journal for Research in Engineering Application & Management, 2019, 5 (3), 161 - 164.

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