# A Hybrid (Wind and Hydro) Power Generation System for Rural Area's Farming)

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*Abstract— There are many water pumping system such as diesel powered, solar photovoltaic mechanical windmill exists. Few combine solar and wind energy sources to provide better performance and reliability to the existing system. In this paper wind turbine and hydro water pumping are analysed separately and are combined as a hybrid system. Large amount of water pumped from the water resources are not effectively used. So a suitable control methodology was proposed to operate the pump automatically depending on the soil moisture. The main objective is to provides 1.Advantage of hybrid system over wind and hydro.2.suitable methodology to prevent water loss.*

*Keywords— wind turbine, Hydroturbine, battery, soil moisture level sensor interfaced with arduino, water pump*

## I. INTRODUCTION

Agriculture Plays A Significant Role In The Socio Economic Development Of A Country. This May Affect The Economic Status Of Our Country. So, In Order To Reduce The Consumption Of Power From The Main Grid, Hybrid System Is Implemented In The Agricultural Land. Thus This Paper Proposes The Method To Utilized The Electric Power Produced From The Hybrid Wind And Hydro System To Pump The Water For Irrigation. The Pumping Of Water Depends On The Availability Of Water Resources. The Effective Utilization Of Water When It Is Available In The Surplus Amount Or In The Demand Condition Is Provided By A Suitable Control Sensor. Hybrid Power Projects Can Be Used To Provide Regular Electricity For Agriculture. first Of All, A Wind Mill Has To Be Installed. By Generating Electricity Through That, The Electricity Will Be Supplied By Starter Of Water Pump Or Motor Pump Then The Supply Continue From Starter To The Motor Pump In The Well. Gsm Based Water Pump Controller Will Be Connected To Motor Starter For Automatically On Or Off Motor Pump.

## II. A WIND ENERGY WATER PUMPING SYSTEM

Wind energy is one of the renewable energy sources which can be used for water pumping applications. In India, wind power generation has gained a high level of attention and acceptability compared to other renewable energy sources. India has highest wind energy potential after the USA, Germany, Spain and China.Pumping of water by means of small wind powered system had became popular due to its flexibility over other mechanical system and its advantage to spare electricity for other applications.

## Working principle

The storage of an adequate of well water is essential for irrigation, wind turbine was used to drive booster pumps. In this system wind turbines are rotate in which convert the wind energy into electrical power energy. which is stored in battery.

Limitations:

Turbines may lead to noise pollution both mechanically and aerodynamically.
The velocity of wind is not consistent, it may affect the performance.
In case of using wind energy , maintenance is required for mechanical components.
The speed of the turbine reduces the wind velocity if they are located near the farms, which may affect the output of the wind turbine.

## III. HYDRO POWER SYSTEM

Hydropower is depend on the convention that when water flowing and falling has a certain amount of kinetic energy potential connected with it. Hydropower comes from converting the energy in flowing water, by means of a water wheel or a turbine, into useful mechanical energy. This energy can then be converted into electricity through means of an elec        tric  generator.  The energy from the flowing/falling water can also be used directly by suitable machines to avoid the efficiency loses of the generator. The mini-hydro system includes a water turbine that converts the flowing water into mechanical energy. This mechanical energy drives a generator which produces electrical power. When water falls on the turbines blades  the kinetic energy and potential energy of water is converted into the rotational motion of the blades of the turbine. The  shaft of the turbine is rotate by rotating blades.

### C.  GSM system:

Hardware Architecture

Proposed design of System is shown in Figure System Contains Aurdino, Water sensor, LCD Display, LED and GSM Modem. All Devices Controlled By Aurdino. Proposed design is fully automated. No need of monitoring always. soil sensor is for moisture sensing, it will send signal to aurdino . aurdino based device will turn on irrigation system. Soil moisture sensor senses the moisture of soil and it sends information to aurdino and aurdino initiate GSM for transmitting message to owner and give the current status of soil moisture After receiving message user can send back message to turn on motor. If soil moisture is more then the sensor gives signal to aurdino and it turn off motor.
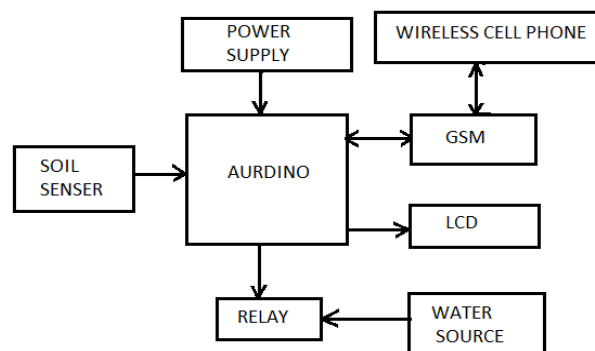


Fig. Block diagram of GSM Module

**Hybrid wind and hydro power generation system:**

The system which uses both wind power and hydro power to farm. It provides better reliability and increases the daily water volume.

While pumping the water to the agricultural land, crops may be destroyed due to the ineffective utilization of the water resurses. This paper proposes the methodology which examines the soil moisture content and gives the command signal to the arduino based microcontroller to control the opening and the closing of the pump depending on the requirement.
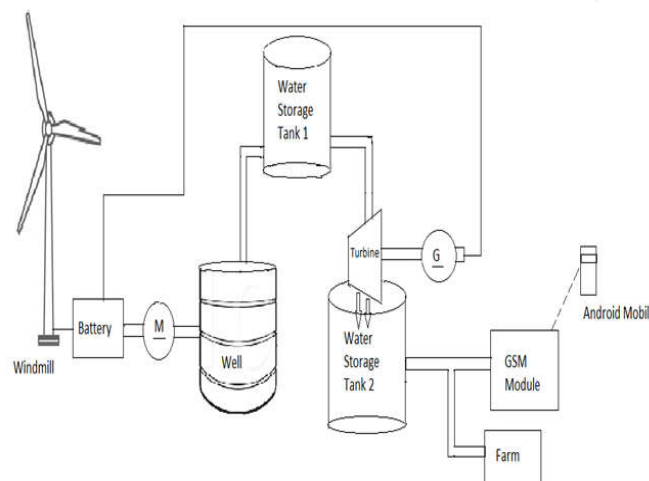


**Fig. Hybrid wind and hydro power plant**

**A. Components used:**

The wind turbine is used for effective utilization of wind energy. since the wind turbine generates the dc current. Dc pump is used only for small scale irrigation and whenever irrigation is  to be done on the large scale AC pump is used. Hydro turbine is used to generate hydro power. Arduino type microcontroller is chosen , since it is an open source electronic platform based easy to use hardware. Soil moisture content sensor is given to the controller.

**B  Analysis of data:**

 It is inferred that about 20 to 3000W of Power may be required for pumping water from the ground. So various parameters should be analysed in order to get the desired output power for pumping. These parameters depends upon the availability of water resources, wind, which varies with climatic conditions. Hence it is important to have an analysis of these parameters.

*Suitability of the Site for wind and hydro*

The following are specific issues that must be considered:

- Locations must be found for the water pump (surface), controllers, storage tank and wind system
- The wind mill should be as close to the pump as possible to minimize wire size and installation cost
- If batteries are to be used, they must be in a reasonably dry/temperature controlled location with proper venting.

- *Efficiency of Wind Turbine:*

In addition to solar power, wind energy is also used here.Hence, the Power per unit area of the wind turbine is calculated using the formula:

$P_{p.u}$=Kinetic energy of wind *

velocity Max.power extracted from wind turbine,

$$P_{MAX}=16*P_{OUT} / 27$$

Where,
$P_{out}$ is power contained in wind and is given by

$$P_{out} = (\text{Air mass per unit time} *\text{wind velocity} ^2)*0.5$$

# IV. Experimental result

In this hybrid system, the power from the wind energy is used to pump water from the well In wind turbine, the kinetic energy of the wind is converted into mechanical energy by means of rotating action of the turbine blades order to improve efficiency. A 12v dynamo is used to convert the mechanical energy into electrical energy.  The power produced from the wind is alternating in nature which is to be converted into direct current. the wind output power is stored in a battery which energizes the DC pump. The well water is strike on the turbine of the hydro, then turbine of the hydro is rotates a water turbine that converts the energy of flowing water into mechanical energy. This mechanical energy drives a generator which produces electrical power.

Result table:

|  | Sr. No. | Revolutions in RPM | Output Voltage (Dc) |
|---|---|---|---|
| For wind | 1 | 150 | 10V |
| For hydro | 2 | 200 | 9V |

Thus in hydroelectricity power plants potential energy of water is converted into electricity. Soil-moisture level sensor is installed at several depths below the soil level. It will sense the moisture content of the soil periodically and gives an electrical signal to the arduino controller. Similarly, water level sensor is placed inside the tank which gives command signal to the controller when the water level in the tank exceeds the desired level. Depending upon the command signal produced by the two sensors, the arduino controller will automatically turn on/off the AC pump by the relay action. This overall circuit will provide the automated water supply for irrigating agricultural land. Moisture level sensor can be placed at various locations below the soil level that depends upon the crops cultivated.

## Conclusions

*Among the renewable energy sources, hydro and wind energy have the ability to complement each other. Further, there are many isolated locations which cannot be connected to grid and where the wind potential and hydro potential exist simultaneously. It only uses the renewable sources of energy, thus forming a standalone hybrid system. Even after installation of this system, if required , additional sensors can also be interfaced with the arduino controller, leading to efficient irrigation.*

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