

## 1 Project Name

Vertical Axis Wind Mill with shrinkage of blades using servomotor and IoT applications

## 2 Introduction

Energy Crisis is the most horrible problem which is faced by the rural area people. Energy obtained by the renewable energy resources like wind energy and solar energy are sufficient to fulfill their basic needs. Our main motto is towards the wind energy. The fastest growing renewable energy sector in India is Wind energy which is vital for economic growth of the country and since independence India has worked on their resources on increasing its energy capacity. This project mainly focus on harnessing the wind energy using a small axis wind turbine capable of working at low wind speed at low heights with less investment cost and maintenance cost.

## 3 Market Research

Generally wind mills are classified on the basis of the rotation of the blade as vertical axis wind mill and horizontal axis wind mill. The main motto of this project is to deliver the electricity to the rural area people in the sufficient manner. For that purpose, select the wind mill as vertical. Vertical axis wind mill are mainly used in the small wind projects and residential applications. Even in low wind speed, the electricity can be generated.

But the customers are expected that the wind mills are to be highly advanced in modern techniques and developments. This project includes the concept of the internet of things with the aid of the Raspberry pi and automation devices like servomotor and air flow sensor which sense the direction of the air. Energy demand is too high but the energy supply is too low. So the rural peoples are suffered by this kind of repression that they will not able to get the electricity as upto the level of expectation.

## 4 Hardware Requirements

- Servomotor which is used to shrink the blades against the air flow direction.
- Air flow sensor used to determine the air flow
- Raspberry pi 4 which receives the feedback from the sensor and control the servomotor
- Data loggers which used to monitor the usage of current under the certain interval of time

## 5 Software Requirements

- Fusion 360 which is used to model the components of the wind mill
- ANSYS software is used to analysis the performance of the wind mill

## 6 Implementation

The principle objective of this project is to construct a most sensitive vertical axis wind mill with high efficiency. It is obtained by reducing the resistive force generated by the blade which is rotating against the air flow direction. Here, the shape of the blade is 'V'. The blade which is opposed by the air flow is to be shrinking by some special mechanism by the action of electrically controlled servomotor. The blade direction is to be monitored by the **air flow direction sensor**. The sensor output is given to the Raspberry pi. Raspberry pi receives the feedback from sensor and control the servomotor. In this type of setup can work on flexible height thus these turbines can be installed on individual houses for household use. This project mainly focus on harnessing the wind energy using a small axis wind turbine capable of working at low wind speed at low heights with less investment cost and maintenance cost.

## 7 Proposed Work Design

The design was drawn from the 3D software namely "FUSION 360". The designed drawing or model is upload in another one analysis software namely ANSYS which analysis the performance of the designed model. The picture is as follows:



Figure 1: Sample Model

## 8 Elements

### 8.1 Air Flow Sensor

Air flow direction sensor is used to sense the wind direction and send the binary input to the servomotor which rotates according the wind rotation and more power should be produced.

### 8.2 Raspberry Pi

The Raspberry Pi is a low cost modulator, which performs like a small size computer and uses a standard keyboard and mouse. The sensor output is given to the Raspberry pi which converts the electrical output into the binary output. The binary output is given to the servomotor.

### 8.3 Data Logger

Data logger is electronic instrument which record the data over the set interval of time. Data logger is used to find the electricity usage of building and manage the peak demand and energy profile. Here the energy used by the building should be eventually monitored. If the energy amount used by the home is small when compared to peak demand, the system sends the message to the user for appreciation. If the energy amount used by the home is large when compared to peak demand, the system sends the message to the user for repression.

### 8.4 IoT

Internet of things is the new concept in an emerging world. In this project data loggers are connected to the raspberry pi. The data loggers find the peak demand and the energy profile of the electricity used by the building. IoT application generate the message to users for appreciation and repression.

## References

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