

# IoT Based Highway Parameter Monitoring and Controlling

Bharati Jagtap<sup>1</sup> Shubhangi Jadhav<sup>2</sup> Priyanka Deokate<sup>3</sup> Prof. S. G. Gaikwad<sup>4</sup>

<sup>1,2,3,4</sup>Department of Electronics & Telecommunication Engineering

<sup>1,2,3,4</sup>SVPM'S COE, Malegaon (BK), Baramati, Maharashtra, India

**Abstract**— Highway Parameter Monitoring through IoT. The fast growing source of energy is wind. We are using the wind energy as it is freely available everywhere. System works the wind turbines is designed to produce wind energy from the highway due to rapid move of vehicles. We can make use of this energy to produce power. Wind turbine is placed at the mid of the highway, it can generate the energy when the vehicles move on the both sides. The generated power is used for nearby street lights.

**Keywords:** IoT, Power, Wind Turbine, Street Light

## I. INTRODUCTION

Energy is the basic need for development and the requirement of energy is more due to the rapid increase in world population, technology and other political and economic condition. Now a day's electrical energy is generated by the conventional energy resources like coal, diesel, and nuclear etc. and these are depleting day by day. So, there is an urgent need to switch on to non-conventional energy resources such as wind energy which are easily available in all condition can be good alternative source. It is fast growing source of energy. The major problem with wind energy is fluctuation of wind. Energy will not be constant every time. So, if we use wind turbines on the highway, there will be constant wind due to rapid moving of vehicles. This power is stored in rechargeable battery that power is used during night hour automatically and the power status we can monitor from base station through the IOT. The demand of electricity is increasing day by day as population increasing. Electricity can be generated by two different resources either by conventional or non-conventional energy resources.

Generation of energy by conventional resources like diesel, nuclear power plant, coal, etc. have negative effect on the environment. It pollutes the air and soil degradation. These conventional resources are very costly. The nuclear waste is harmful and cause negative effect on the body. As days goes on the conventional resources may not exists so we must find some alternative method for generation of electricity. The non-conventional resources are an alternative source for generation of electricity. There are different types of non-conventional resources mainly wind, solar, tidal, etc. In this project we are using wind for generation of energy as it is freely available everywhere and there is no need is pay for the resources.

The energy which is produced by wind turbines due to rapid movement of vehicles on highway is basically controlled from the base station through IOT. The amount of energy that is generated by wind turbines are used for nearby street lights on highway and nearby villages. This method is environmental friendly renewable and can fulfill the demand of electricity at some extent.

## II. LITERATURE REVIEW

1) Ashish S. Ingole, Prof. Bhushan S. Rakhonde et.al, "Hybrid Power Generation System Using Wind Energy

and Solar Energy" [1]. Now a day's electricity is most needed facility for the human being. All the conventional energy resources are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this the combination of two energy resources is takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Basically this system involves the integration of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity will be takes place at affordable cost. This paper deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance.

2) C. M. Vivek, P. Gopikrishnan, R. Muruges, Raja Mohamed et.al, "A Review on Vertical and Horizontal Axis Wind Turbine", 2017 [2]. Wind energy is one of the major forms of renewable energy resources found abundantly which is widely used as an alternative energy. Wind power is sustainable and the production of electricity using wind energy is increasing day by day due to lack of availability of fossil fuels. The energy can be converted into electricity by using vertical axis wind turbine (VAWT) and Horizontal axis wind turbine (HAWT). The vertical axis wind turbine is highly used for domestic applications where the volume of production is low and efficiency is optimal while the horizontal axis wind turbine is widely for larger volume of production requires huge investment and the efficiency is high. This paper focused on increasing the efficiency of using wind energy by producing large amount of electricity and reduces the space for installation. This can be done by combining the vertical axis wind turbine (VAWT) and horizontal axis wind turbine (HAWT) in a same tower. The combined vertical and horizontal axis wind turbine reduces the cost for larger volume of electricity generation.

3) S. Prakash, S. P. Vijayaragavan et.al, "Wireless Wind Turbine Monitoring Using Arduino", 2015 [3]. This project describes the design and implementation of a Wireless monitoring system for turbines using Arduino. Here we employ an Arduino based wireless system that measures and transmits the different electrical and mechanical parameters of the turbine. The parameters that are to be monitored are current, voltage, speed and vibration in the turbine. These parameters are sensed and given to the Arduino. Arduino transmits the parameters using suitable medium to a PC which enables remote monitoring. This can be done using Arduino with RF wireless technology. Arduino is an open source platform,

both in terms of Hardware and Software. RF is a new kind of low complexity, low power consumption, low data rate and low cost wireless network technology.

- 4) Pramod M S, Naveen P N, Chaithra N R, et.al, "Monitoring Of Highway Wind Power Parameter and Controlling Highway Light Through IOT" 2017 [4]. The aim of this project is to improve the efficiency, quality and improving of the street light using Wi-Fi module. The automatic control of street light and maintenance solves the problem like maintaining of street light, display problem, and connectivity problems. The wind turbine is designed to produce wind energy from the highway due to rapid move of vehicles. The fast growing source of energies are wind and solar. In this we are using the wind energy as it is freely available everywhere. Due to the movement of vehicles, the wind energy is enormously produced on the highways which are unused. So, we can make use of this energy to produce power and to overcome some problems of electricity. Now, we can place the windmill or wind turbines at the mid of the highway, because it can generate the energy when the vehicles move on the both sides. The generated power is used for nearby streetlights. All this parameters are controlled and monitored through IOT from the base station.
- 5) Prakhar Srivastava, Mohit Bajaj, Ankur Singh Rana, et.al, "IOT Based Controlling of Hybrid Energy System using ESP8266" [5]. There is various combination of energy and all of them are alternative to each other like solar energy, wind energy, bio fuel, fuel cell, etc. But the need of controlling of hybrid energy system arises when it is installed for domestic or commercial purpose. At this point IOT plays an important role in controlling system. The main criteria being switching between the two sources of energy i.e. solar and wind energy without any inconvenience through a website using ESP8266 Wi-Fi module. The data is transmitted wirelessly through website to ESP8266 module which controls the sources of energy. The transmitted data is controlled remotely using IOT. This enables user to have flexible control mechanism remotely through a secured internet web connection. This system helps the user to control the sources of energy, manually and remotely using smart phone or personal computer. This system is very efficient, cheaper and flexible in operation.

### III. PROPOSED SYSTEM

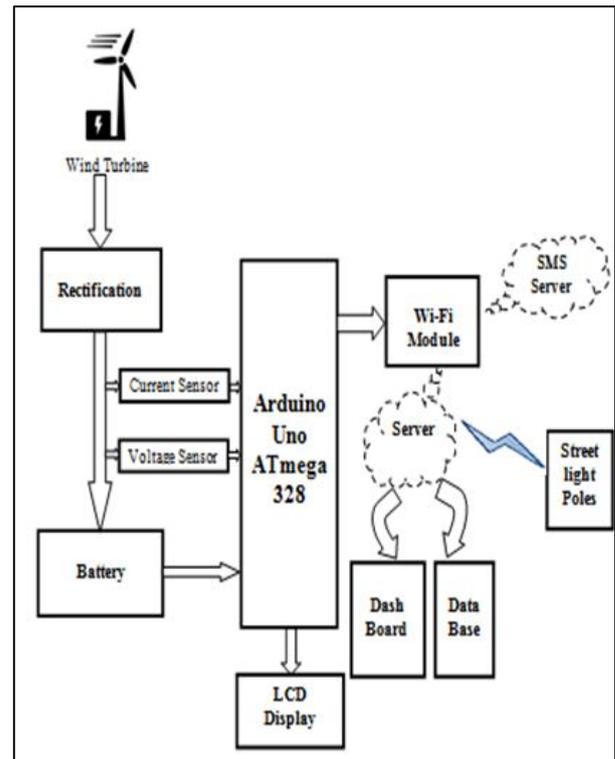


Fig. 1: Block diagram for IOT Based Highway Parameter Monitoring and Controlling.

This project describes the design and implementation of a Wireless IOT based monitoring system for turbines using IOT Technology. Here we employ an Atmega328 based wireless system that measures and transmits the different electrical parameters of the system. The parameters that are to be monitored are current, voltage, battery status of the system. These parameters are sensed and given to Arduino Uno microcontroller. Microcontroller transmits the parameters using suitable medium over the Wi-Fi communication protocol to the cloud server. From there we can analyse the status of our system as well as the battery health monitoring and according to the battery charging level we can dim the appropriate light poles of the system using this system, so we can get undisrupted output light even if low battery. Also, some time thieves try to steal those charging batteries so in this situation if they tried to steal the batteries then we can get immediate alert about the situation using the third-party SMS service that have implemented in this system. It consist of different hardware components mainly,

- 1) Arduino Uno (ATMega328)
- 2) ESP8266 Wi-Fi Module
- 3) Wind Turbine
- 4) Voltage Sensor
- 5) Current Sensor
- 6) Charging Battery
- 7) I2C 16x2 LCD display
- 8) Street light Poles

#### A. Arduino Uno (ATMega328):

Atmega328 based wireless system that measures and transmits the different electrical parameters of the system. The parameters that are to be monitored are current, voltage,

battery status of the system. These parameters are sensed and given to Arduino Uno microcontroller. Microcontroller transmits the parameters to the LCD and suitable medium over the Wi-Fi communication protocol to the cloud server.

#### *B. ESP8266 Wi-Fi Module:*

The data is transmitted wirelessly through website to ESP8266 module which controls the sources of energy. The transmitted data is controlled remotely using IOT. This enables user to have flexible control mechanism remotely through a secured internet web connection. This system helps the user to control the sources of energy, manually and remotely using smart phone or personal computer. This system is very efficient, cheaper and flexible in operation.

#### *C. Wind Turbine:*

A 12v dc motor is used in wind turbine to converts the mechanical energy produced by the rotor blades into electrical energy or power.

#### *D. Voltage Sensor:*

Voltage sensor module measures the electrical voltage (volt) running through the circuit by connecting sensor points on one side of the circuit. Here actually voltage divider circuit is used as in voltage sensor. The voltage sensor sensed the voltage and given to the Atmega328 microcontroller. Display the voltage value on LCD.

#### *E. Current Sensor:*

This sensor measures the electrical current (amps) running through the circuit by connecting sensor points on one side of the circuit either positive or negative junction. The current sensor sensed the current and given to the Atmega328 microcontroller. Display the current value on LCD.

#### *F. Charging Battery:*

We need 5V power supply. In the power supply, we have used 12V removable General purpose battery. If turbine is rotated then the generated power is stored in battery and this stored power is used for proposed system

#### *G. I2C 16x2 LCD Display:*

The I2C 16x2 LCD are used for display the voltage and current value on LCD display. It uses the 5V power supply to display the information.

#### *H. Street Light Poles:*

The Street light Poles are used as an output. If turbine is rotated then the generated power is stored in battery and this stored power is used for controlling the street light (LED is on).

to our honorable Principal Dr. S. M. Mukane for providing necessary environment and facility to conduct our project work. Finally I want to thank my family for the continuous encouragement, understanding and moral support.

## IV. CONCLUSION

The energy which is produced by wind turbines due to rapid movement of vehicles on highway is basically controlled from the base station through IOT. The amount of energy that is generated by wind turbines are used for nearby street lights on highway and nearby villages. This method is environmental friendly. As the population increases increasing day by day, the demand of electricity are also increasing. Generation of energy from nonrenewable resources is insufficient to fulfill the need of common man and damaging the environment. The wind and solar are renewable resources which are freely available everywhere and we are using it effectively for generation of electricity. This may fulfill the demand of electricity to some extent.

## REFERENCES

- [1] Ashish S. Ingole, Prof. Bhushan S. Rakhonde, "Hybrid Power Generation System Using Wind Energy and Solar Energy", International Journal of Scientific and Research Publications, Volume 5, Issue 3, March 2015, ISSN 2250-3153.
- [2] C. M. Vivek, P. Gopikrishnan, R. Muruges, R. Raja Mohamed, "A Review on Vertical and Horizontal Axis Wind Turbine", International Research Journal of Engineering and Technology. e-ISSN: 2395-0056, p-ISSN: 2395-0072 Volume: 04 Issue:04 April-2017.
- [3] S. Prakash, S. P. Vijayaragavan, "Wireless Wind Turbine Monitoring Using Arduino", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 7, July 2015.
- [4] Pramod M S, Naveen P N, Chaithra N R, "Monitoring Of Highway Wind Power Parameter and Controlling Highway Light Through IOT", IEEE International Conference On Recent Trends in Electronics Information & Communication Technology (RTEICT), May 19-20, 2017.
- [5] Prakhar Srivastava, Mohit Bajaj, Ankur Singh Rana, "IOT Based Controlling of Hybrid Energy System using ESP8266", 978-1-5386-1138-8/18/31.00 ©2018 IEEE.

## ACKNOWLEDGMENT

It brings us great pleasure in submitting this seminar project report with the deep sense of gratitude profound respect. We should like to thank our guide Prof. S. G. Gaikwad of E and TC department, for valuable guidance constructive suggestions. This helps us in preparing this project report. We are also very grateful to Dr. A. A. Patil, Head of department, for his timely guidance and innumerable suggestion. He has been ever helpful, boosting our morale and confidence and advising us on how to best than better. We are also thankful