ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

Measurement of Mechanical Vibration and Temperature of Wind Turbine

Kanhaiyya Prajapati [1], Anand Pathrikar [2]

M.E Student, Electronics and Tele-communication, DIEMS, Aurangabad, India[1]

Assistant Professor, Electronics and Tele-communication, DIEMS, Aurangabad, India[2]

ABSTRACT: The aim of project is to monitor the mechanical vibration, temperature in a wind turbine for efficient operation of wind turbine using ARM7. Importance of condition management of wind farms and wind turbine components increases with growing turbine sizes, especially at offshore installations and other isolated sites. Wind Turbine Condition Measurement application is based on a detailed model of wind turbine components. The system analyses the turbine operation, calculates mechanical component fault, and Measures the temp. Of turbine components and indicates their changes. The system monitors the mechanical condition of the wind turbine key components with vibration and temperature with temperature sensors. Vibration and Temperature monitoring is performed with Spring vibration sensor and temperature sensor such as LM35. Results from the analysis stations are saved into the database server from which the user interface software reads their values and displays them on the screen. This processing is performed remotely through a computer that receives the data submitted via wired network presenting them to the user via graphical interface. If a fault is detected in wind turbine then we can avoid major failures by using this system.

KEYWORDS: Wind turbine, ARM processor, mechanical vibration, temperature sensor

I. INTRODUCTION

Wind power is world's fastest growing renewable energy resource. It converts mechanical energy into electrical energy. Wind turbines system are located in harsh environment such as desert, mountains apart from that they are located away from the control centre so there is a chance of fault occurrence and the side effects will be more, even it leads to power off. So it is necessary to develop the remote monitoring and fault diagnosis system to monitor the run time status and the diagnosis of fault is to improve the efficiency and the life time service of the wind turbine.

II. RELATED WORK

Wind turbine maintenance costs has shown that up to 40% of the cost can be related to unexpected failures of components of turbine that then lead to unscheduled corrective maintenance actions. Unscheduled corrective maintenance of the wind farm is the most costly type of maintenance, and it is always at high risk for consequential damages. To avoid these problems using the predictive maintenance for that condition-based monitoring of wind farm is done[1]. The importance of monitoring of Wind Turbine with fault diagnosis system and the CAN Bus which is used as Interface module in order to communicate the monitored parameters between the Wind Turbine and the control centre by using the RS-232 Serial Communication. Here GPRS is used to transfer the data from wind turbine section to control room[2].CBM is a preventive maintenance that involves continuous health monitoring of a WT unit. However with latest developments of the field sensing and signal processing techniques, CBM has been gradually adopted into maintenance decision making of wind farms

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

III. BLOCK DIAGRAM AND DESCRIPTION OF THE SYSTEM

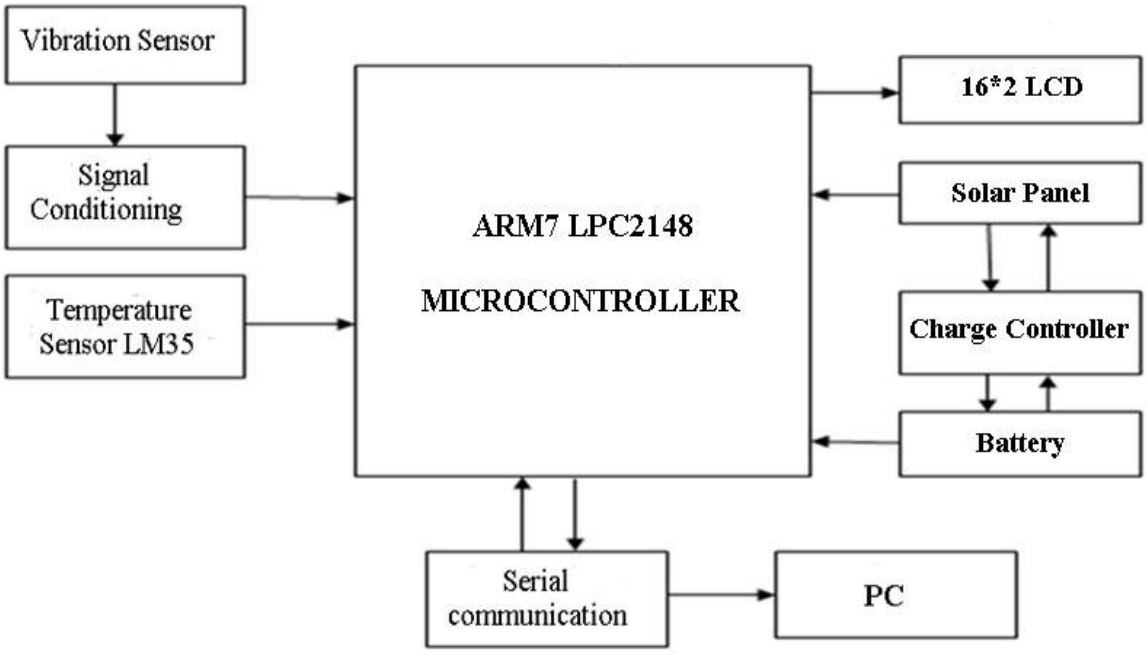

Fig 1.Block diagram of system

A. **Vibration Sensor**

Vibration analysis is the technology applied for condition monitoring, especially for rotating equipment. Vibration Sensors are used to detect the vibration in the wind turbine. As vibration sensor used is spring sensor is placed on the shaft or gearing of wind turbine in order to detect the fault in it. Vibration sensor acts like a switch such as when vibration comes it gets on that is vibration two leads get connected and gets on and when vibration removed it gets off. Vibration measured value is produce on LCD and PC. If vibration going to increased above certain limit then it will show and we can avoid failure of system from breakage.

B. **Temperature Sensor**

Temperature sensor used in this is LM35. The LM35 series are precision integrated-circuit temperature sensors, whose temperature vary according to output voltage. Monitoring the temperature of the observed component is one of the most common methods of Conditioning Monitoring (CM). Temperature measurement(TM) helps in detecting the presence of any potential failure related to temperature changes in the system. Temperature Measurement is reliable because every piece of equipment has a limited operational temperature.

C. **Solar Panel**

Solar panel is photovoltaic modules that are designed to absorb the sun's rays as a source of energy for generating electricity. This generated energy is used is used to charge the 12 V rechargeable battery.

D. **Operation of System**

Vibration Sensor and Temperature sensor measures the vibration and temperature respectively. These measured values are in the form of analog that are passed to the ARM7 microcontroller. This microcontroller convert analog signal to digital using ADC .this data are sent from UART serialy using RS232 to PC, and corresponding parameters are measured on PC and LCD

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

IV. RESULT

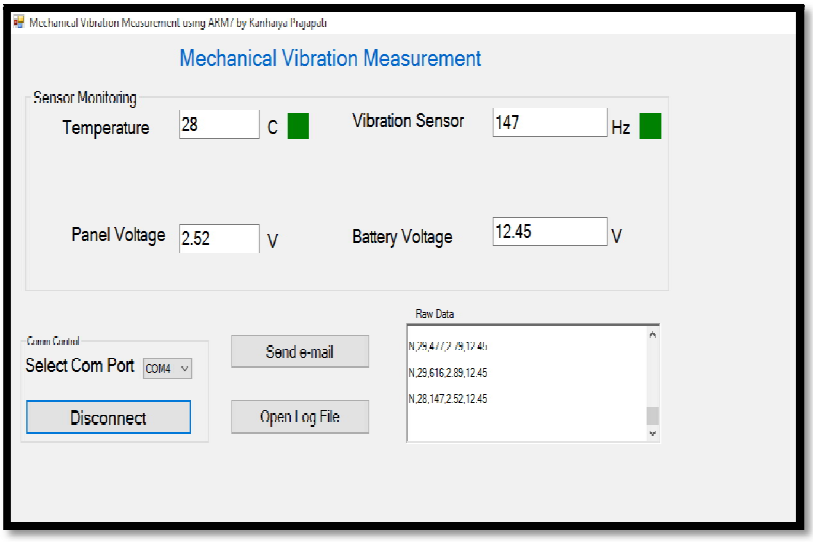

Fig 2.Parameter measurement

This system allows to take the measurement of mechanical vibration and temperature of wind turbine. The software is user friendly graphical interface that helps to avoid the catastrophic failure of the system. If vibration increased beyond threshold level then it will indicate by changing green tab to red tab. Email connectivity is given from which all the data can be send to user.

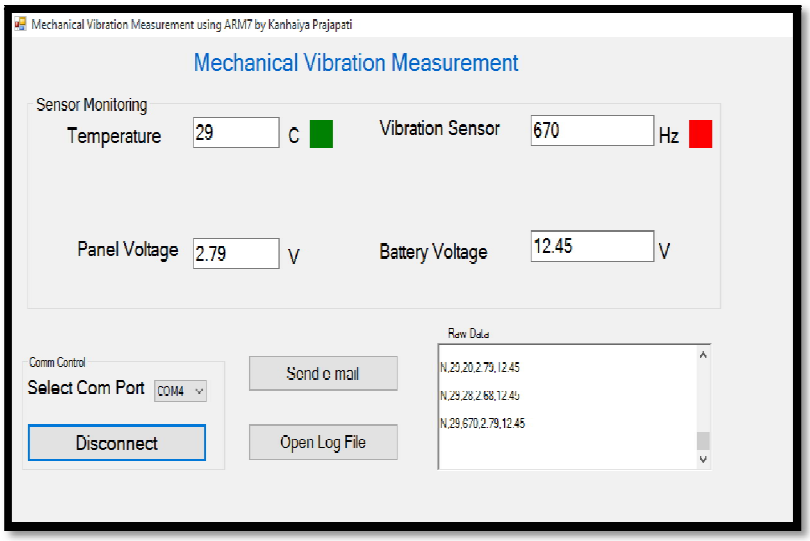

Fig 3.Mechanical vibration when exceeds threshold level

V. CONCLUSION

The system enables the monitoring of higher vibration, rise in temperature, of the Wind Turbine using the developed methodology to avoid blasting hazard. One of the most serious problems in wind turbines is the possibility of mechanical failure which caused by rotor imbalance conditions especially for rotating parts of gears and generators.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 7, July 2016

Therefore, a machine health measurement system is a very important tool in wind turbines. The software proposed a friendly graphical interface that helps in making Decision to avoid catastrophic failures.
The implementation LCD and PC can be used to provide the range of abnormality levels using ARM processor, which makes it possible to detect the abnormalities before failure. It is very useful system which is useful for monitoring system in order to avoid from failures.

REFERENCES

1. K.Rajasri, A.Bharathi , K.Rajavel, "Management of Mechanical Vibration and Temperature in Small Wind Turbines Using Zigbee Wireless Network", Volume. 2, Issue 7, July 2014.
2. L.Senthil, Murugan, K.S.AswathRangaraj, D.Mathesh, "Design of Monitoring System and Fault Diagnosis in Wind Turbine Based On Can Bus Using ARM" Volume 3, Special Issue 2, April 2014.
3. Sachin Sharma & Dalgobind Mahto "Condition Monitoring of Wind Turbines" Volume 4, Issue 8, August-2013.
4. T. Karpoora Eswari, R. Karpaga Priya "Designing of Embedded System To Monitor A Wind Turbine" Volume No.03, Special Issue No. 02, February 2015.
5. Jaishree.S, Dr.K.Sathiyasekar, Sonika.S,"Wireless fault detection and preventive system for Small Wind Turbine" Vol. 3, Issue 3, March 2014
6. Ruoyu Li and Mark Frogley," On-Line Fault Detection in Wind Turbine Transmission System using Adaptive Filter and Robust Statistical Features" 2013.
7. Jamdar Dadaso Pralhad, Prof. Sujatha K.Rao, "CAN Bus based system for monitoring and fault diagnosis in Wind Turbine", Volume 2 Issue 6, Nov 2015.
8. T.W. Verbruggen, Wind Turbine Operation & Maintenance based on Condition Monitoring, April-2003.
9. Wei Qiao," A Survey on Wind Turbine Condition Monitoring and Fault Diagnosis−Part II: Signals and Signal Processing Methods" Volume 2 issue 99, 2015.
10. Wang chuhang Network Center of Chanchun Normal University, Remote Monitoring and Diagnosis System for Wind Turbine.
11. Ran Bi, Kejun Qian, Chengke Zhou, Donald M Hepburn, Jin Rong, "A survey of failures in wind turbine generator systems with focus on a wind farm in China", May 10, 2014.
12. Spandana K, Raju," Monitoring and Faults Diagnosis in Wind Turbine by Using Zigbee Wireless Network", Volume 2, Issue 11, November 2015.