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A CAN Bus Based System for Monitoring and Fault Diagnosis in Wind Turbine

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Abstract: ***This paper describes the monitoring and fault diagnosis system for wind turbine using CAN interface. Electrical energy can be produced using fossil fuels and also by natural resources. The production of electrical energy using fossil fuels is costlier when compared to natural resources. Solar, wind, thermal and tidal energy are most widely used natural resources for the production of electrical energy. Presently wind energy is most widely used natural resources which could reduce the emission of carbon dioxide. The cost of the wind turbine is extremely higher and work in harsh and unattended environment. Hence the monitoring and the automation of wind turbine are necessary. This paper describes the monitoring and fault diagnosis system for wind turbine using CAN interface. The monitoring parameters and CAN interface are described in detail.***

Keywords: PIC18F458, GSM Module, CAN bus, MCP2551, PC

1. Introduction

Wind turbine is a rotating mechanical device that converts wind energy into mechanical energy resulting in the production of electricity. Wind turbines are fault prone, that is they are deployed in harsh environment such as desert, plains apart from that they are complex electromechanical system that are located far away from the control centre . So the chance of fault occurrence and the side effects will be more, even it leads to power off. It is necessary to develop the remote monitoring and fault diagnosis system to monitor the run time status and the diagnosis of fault to improve the efficiency and the life time service of the wind turbine. Wind turbine monitoring system collects the parameters such as Speed, Temperature, vibration, power, voltage and current from the main components of turbines such as shaft, gear box, generator and nacelle. Depending on the collected data from the monitoring system analysis is done and the fault diagnosis system makes the decision of location and the type of fault to be occurs in the wind turbine. This analysis is uploaded to the mobile web server and an SMS is sent if there is chance of fault occurrence. The advantage of using CAN bus in the automation is an added value to the system and increase its reliability .The purpose of using CAN bus is to enable any system to communicate with other system without putting too much load to the main controller. CAN bus is a fast serial bus with the speed of 1 Mbps that is designed to provide an efficient, reliable and economical link between various CAN systems, sensors and actuators. We use CAN to communicate between the Wind turbine and the control centre which adopts client/server frame works to implement the monitoring and fault diagnosis system.

2. Figure

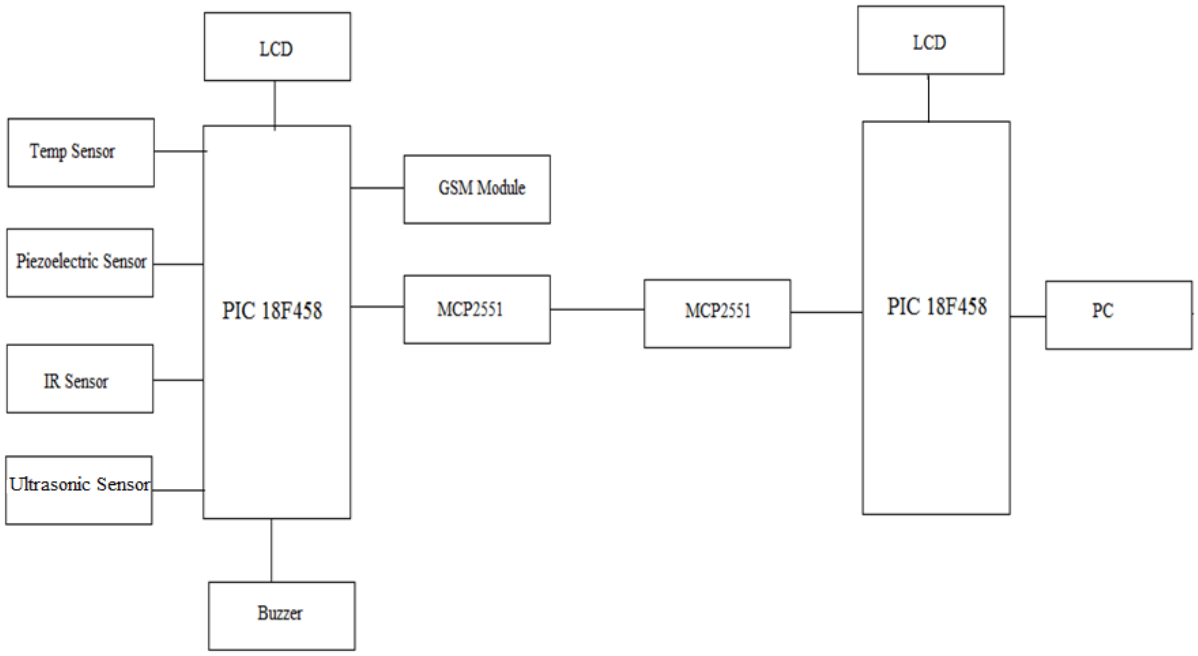

Figure: Block Diagram

In our block diagram the two main component is the PIC microcontroller and the CAN bus protocol. In first section the power supply is designed to get the proper voltage for perform the entire operation of the circuit. A 12 volt supply for the DC motor and 5 volt supply for the PIC operation. Without getting proper voltage motor will not be start.

We are using the four basic sensors in our designing module, they are temperature sensor, vibration sensor, IR sensor and oil level sensor. these sensors are give the output in the analog form, so ADC which is inbuilt in the PIC convert it into digital form. Whatever the output is getting first displays on the LCD (Liquid Crystal Display). The another aim of this design is to fault diagnosis. For that purpose we are using the alarm system to indicate that fault occurrence in the particular turbines.

At the output section we are giving the all outputs coming from the microcontroller to the display unit or server section. In real time application the wind turbines and the server section are placed at a great distance from each other. So for that purpose we are using one data transmission protocol named as CAN protocol. The data transmission between the two wind turbines is also possible by using this system. And if their fault occurs in the turbines we are using the GSM module for the purpose of that giving the message for safety purpose.

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