Design and Implementation for Monitoring and Fault Diagnosis in Wind Turbine Using Arm Controller and CAN Bus System

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***Abstract* - This paper is a CAN based architecture designed for the purpose of monitoring and fault diagnosis of wind turbine. In this project we declare the system with ARM and CAN protocol to monitor and diagnose the problems in the wind turbine application. The project deals with the data transmission between two units in the exact time without any disturbance. The data transmission time is increased with the CAN protocol. ARM core1 runs with CAN and LPC2148 as wind turbine unit to which sensors are connected and ARM core2 as Fault diagnose and monitoring section. A discussion about weather condition (WC) monitoring and generation voltage (GV) display is also added in this design. Data acquisition node collects the sensor data through CAN protocol. The basic view of this technique is to reduce the possibility of fault diagnosis and increase the monitoring of wind turbine.**

1. INTRODUCTION

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 center. 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. 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.

2. CONTROLLED AREA NETWORK

CAN bus is a network protocol which is used for communication between the microcontrollers or any other devices without the use of any master computer. CAN is basically designed for industrial networking but now adays it finds wide use in automation, mobile machines, military and other harsh environment monitoring application. CAN bus does not hold any address between the transmitter and the receiver. Instead it holds the unique identifier which is a numeric value used to label the message throughout the network. Each of the receiving nodes provides the acceptance or uses the filtering to check whether the message is relevant to the particular node or not. If the message is relevant to the particular node the message is received and processed or else the message gets distorted. In this project we transmit the sensor signal from receiving node to processing node with the high speed communication with CAN bus. CAN transmitter act like a transmitter and the receiver. From the project we can connect 'N' number of wind turbine through the CAN bus. And continuously monitoring the all turbine. Alert will be given by the priority.

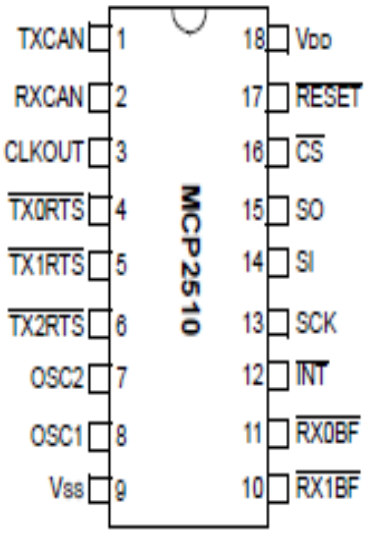


Fig 2.1 CAN bus pin diagram

3. ARM MICROCONTROLLER

In this project we using two ARM controller one in the receiver side and another one in the processing side. Receiving section received the signal from the sensors which connect in that ARM and transmit the signal to the processor side ARM through the CAN bus. Processor node ARM will act depend upon the signal which collected from the receiving side node. Incase the temperature inside the turbine will get increased means the receiving side node will sense and that and send the signals to the processing node and processing node ARM will switch on the coolant fan to control the temperature in the turbine side.

4. MEMS VIBRATION SENSOR

Using the MEMS sensor to calculate the vibration in the wind mill and vibration of the turbine to product the turbine from the savior condition. While in the earth quake the mill will be getting abnormal on that time we have to calculate the vibration in frequency. And we prevent the wind mill from the critical condition. The wind mill will be placed in the some sort of critical places on that time the turbine will be collapsed, so it will be create some vibration due to the friction between gear. We stopped the turbine suddenly and reduce the damage in the turbine.

5.BLOCK DIAGRAM

In the receiver section we placed all sensor and the receiver section will be placed in the inside of the wind turbine. Humidity sensor will use to find the weather condition placed in that place. And we calculate the generating voltage to find the efficiency of the turbine, if efficiency is not sufficient means we service the turbine to get the efficiency output. Calculate the speed of the blade using the IR RPM counter, if it exceeds the over speed it will trip the turbine.

Another ARM will be placed in the processing node and get the sensed value through the CAN bus, data will displayed in LCD display, create alarm on critical condition. We can connect multiple system in the receiver section and monitoring the all section from the single monitoring section.

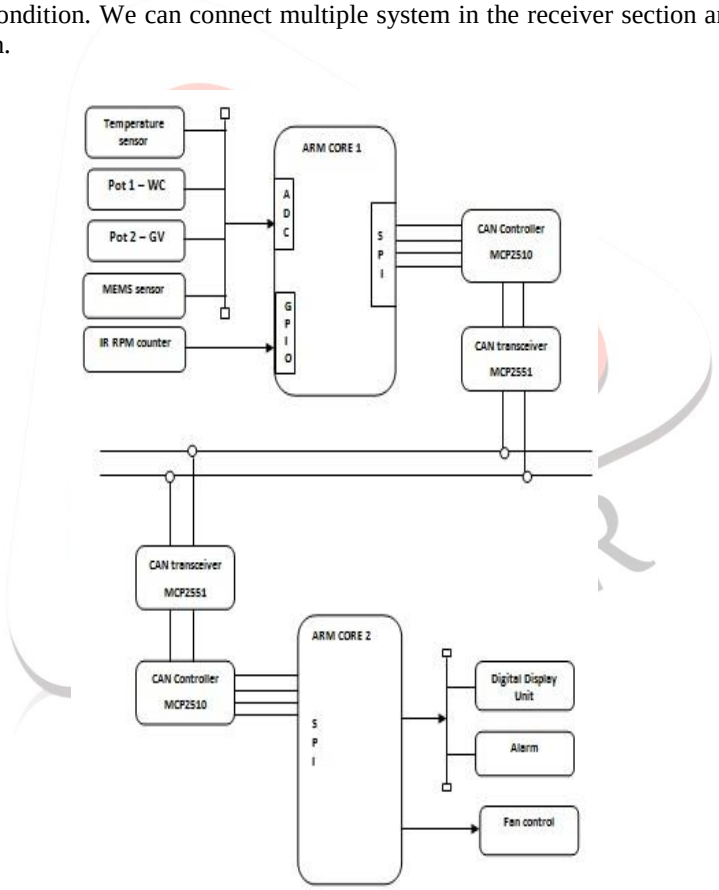
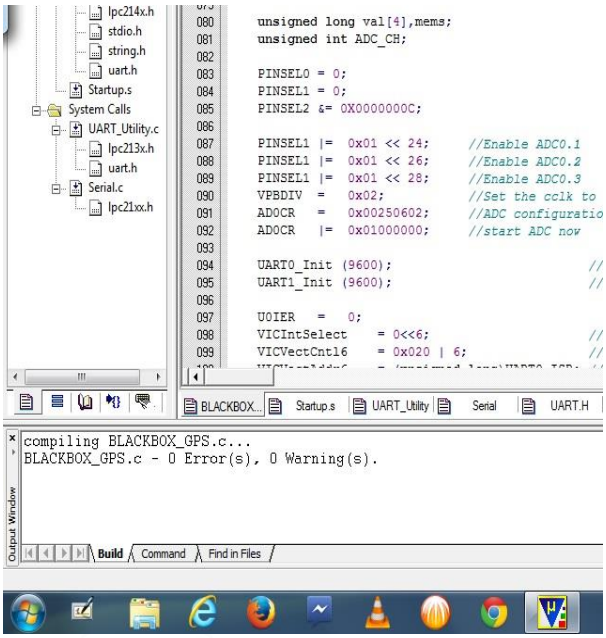


Fig 5.1 block diagram

6.SIMULATED OUTPUT



7.CONCLUSION

In this project we declare the system with ARM and CAN protocol to monitor and diagnose the problems in the wind turbine application. Data processing node collects the sensor data through CAN protocol. The basic view of this technique is to reduce the possibility of fault diagnosis and increase the monitoring of wind turbine.

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