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# Age Monitoring and Fault Detection using Iot

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***Abstract*: The Internet of Things (IoT) has a monumental development in recent trends of commercial, environmental, and medical applications. The motors are considered the most important device in industries as of today. Hence, it is necessary to detect the defects of the motor and to increase the attention of defect detection by using different kinds of technologies like IoT. The advantages of a motor is that it is a simple rotor construction resulting in low value, ruggedness, and has low maintenance needs. Here, we present a condition observation with fault detection system for motor supported Internet of Things (IoT) for safe and economic electronic communication in industrial fields and we measure the aging of the motor by this system. To develop a motor observation system for detecting the defects and to calculate the aging (i.e) Lifespan Prediction of the motors is the key concept of this project.***

***Keywords:** Fault Detection, Internet of Things (IoT), Life time prediction, Motor Systems.*

## I. INTRODUCTION

There are three basic reasons for the employment of single-phase motors instead of three-phase motors first most Houses, office establishments and rural livelihoods are employed with single- phase motors for the main reason of easier installation and distribution. Second Single Phase motor system has a simple circuit when compared to a three phase motor and hence they have more domestic applications. And third Single phase motors are simple in construction, reliable, easy to repair and comparatively cheaper in cost and therefore, find wide use in fans, refrigerators, vacuum cleaners, washing machines, other kitchen equipment, tools, blowers, centrifugal pumps, small farming appliances etc.
The paper proceeds by Pre-existing system under Section II, then Method of working on Section III along with the main parameters and parts Section IV and V. Finally comes the result and conclusion in sections VI and VII.

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## II. EXISTING SYSTEM

IOT devices can fail in the field mostly because of Pressure, Voltage and Temperature effects. Consistent performance over the long run is one of the main issues, which concerns IOT devices. In order to detect the defects and motor system failure reasons, online monitoring systems can be used. It includes online PVT monitoring using devices that have IOT attached to them. They report the collected to a cloud storage with the help of a Wi-Fi or an internet connection. This kind of system needs a interlink between the sensors or chips which is placed along the motor system which takes the readings for every RPM (Rotation Per Minute) and stores the data in a database in the cloud storage. The data that is stored can be taken for further calculations and predictions along the cloud storage itself thereby making it to be accessed across any part of the globe. The results and observations may vary depending on your location since we have varied time zones across the globe. IOT devices are basically used for real time data collection or otherwise known as continuous data monitoring along the system, which is to be monitored using cloud as a storage option for the collected data. It helps the user to enable access of this system from any part of the world. This system helps to eliminate manual checking of the machines, which are under operation 24/7 thereby increasing the machine down time as well as the lead time of the product manufacturing. The storage along cloud helps the user to get the data uninterrupted even in the case of any shutdowns or can even turn off the system which is not performing as expected from their location with just a touch on the user interface of this IOT device. The accuracy of these devices are far more better than any mechanical fault detection tools and hence it prevents error in data collection, inappropriate measure, uncompleted products, more reworks along the product line hence saving product lead time. Since this system is easier to use as much as repairing can even be done through online or at worst case scenario replacing the parts manually.

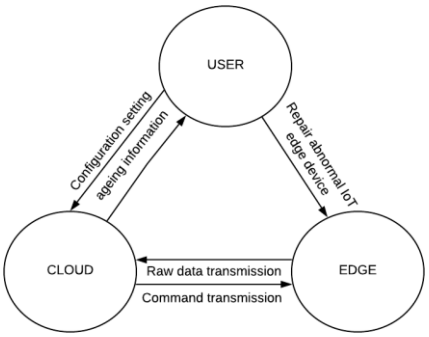


**Fig.1. Flow Diagram**

The generic method of analyzing and detecting the life time of an IC based Single phase motor system is done by checking few characteristics of such as noise, drag and increased heat production along the motor system. On an average, there is a failure rate 7% a year, which means that a company which has 100 and above motor will have a motor failure every month and even a single motor failure can also cause an entire production to make to a halt.

The statistical analysis has to made on each part of the motor so that we can predict its life time accurately. The age prediction of the system is done by using specific sensors such as a ring-oscillator. The main reason for using a ring oscillator is that it measures readings under varying temperatures or voltage stress conditions.

The above mentioned method of analyzing the life span of the motor system is becoming more and more needed during the design and manufacturing of an efficient IC based motor system. This method may not be 100 % efficient but still it helps in early identifying and providing simultaneous feedback on improving the life span at the beginning of the design process itself. There might be some defects apart from these arising in it, which cannot be identified at the design step itself, but they too have an effect on working of the system in reality.

## III. METHODOLOGY

In Proposed system, a DC supply is fed to the IC circuited single phase induction motor. The micro controller Atmega328 has various sensors that are interfaced with it such as sound sensor, IR sensor and Temperature Sensor and an IOT system with it. These sensors are used to monitor, readings of some parameters like Noise, Speed and temperature and those observations, which are the values are uploaded in the cloud server connected to that respective motor. The measured results are transmitted to corresponding pins of controller through interface circuit, which is designed to interface the measuring circuit and controller.

- The monitored data is simultaneously fed into the Atmega328 microcontroller and also uploaded to IoT system.
- The uploaded data is stored in a cloud server which helps the user to take the data and to make meaningful insights from it which helps in predicting the maintenance of the motoring system.
- Hence, we are able to make a continuous monitoring of these parameters of the machine from a remote location far away from the actual working location using IoT.

## IV. MAIN PARAMETERS

### A. Noise

Noise is one of the main parameters, which can easily detect the condition of working of a motor system. Noise is a dependent variable with respect to working of the system, like increase in noise decreases the functional efficiency of the system. This monitoring can be done by using a Temperature monitoring

### B. Speed

Speed is also a parameter to be considered for detecting the life span of a motor system. The variation in speed of the motor also implies that there is a drag in the motor and so maintenance has to be provided for the unit. The speed detection is done by using IR sensors.

### C. Temperature

Temperature is yet another parameter that has to be monitored which has an serious impact on the life time of the motor system. This can be monitored using a temperature sensor.

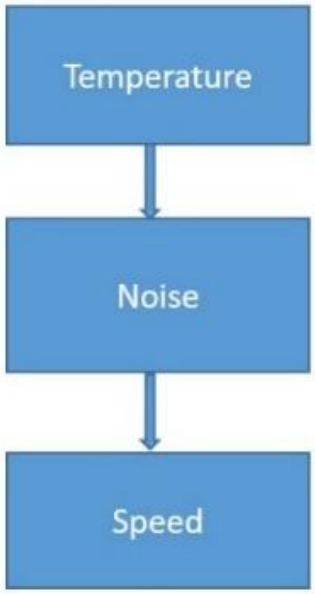


**Fig.2. Hierarchy of Parameters**

### D. Block Diagram

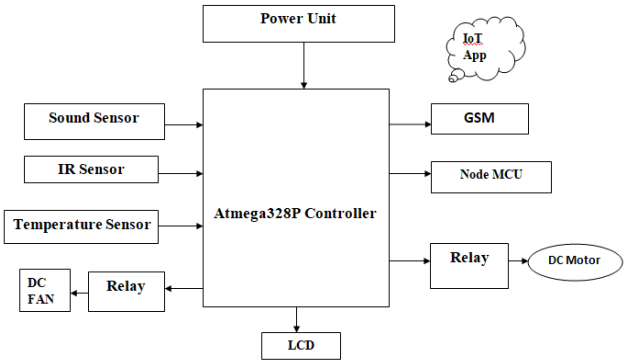


**Fig.3. Block Diagram**

## V. COMPONENTS USED

The various components that are used in this study are mentioned in detail below which are:

A. Micro-Controller
B. IR Sensor
C. Temperature Sensor
D. Sound Sensor
E. LCD
F. GSM
G. Node MCU

### A. Microcontroller

The microcontroller, which we have used for this study, is Atmega328 which is a single chip microcontroller. It has 23 input and output pins with many working registers along with flash memory which can read the data, write the data in the database and process tasks too all at a simultaneous process. The operating voltage varies between 2 to 5 volts. It receives signal from various monitoring units of the induction motor. Protection can be done more effectively with this microcontroller. ADC converts analog inputs into digital signals within the microcontroller. The data collected from the motor are displayed in Liquid Crystal Display (LCD).

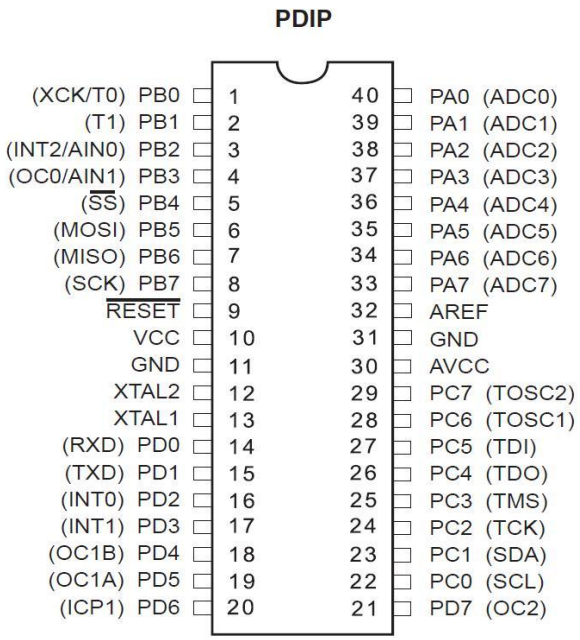


**Fig.4. ATMEGA328 Microcontroller**

### B. IR Sensor

The main function of this sensor is to measure the speed of motor. It is pair of two LED's in it, which are used for the measurement. Each LED has its own functioning in which one is used to radiate infrared waves and the other one absorbs them.

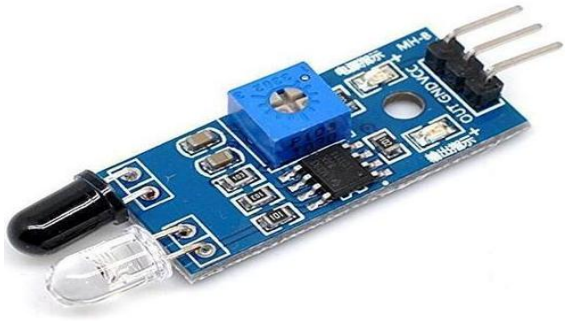

**Fig.5. IR Sensor**

### C. Temperature Sensor

Temperature sensors are used device to measure the temperature in the motoring system, which is under observation. It helps to understand the temperature difference in the motor under varying load conditions. Whenever the temperature rise in the motor cross the limit of the motor standard temperature level the motor will intimate or send a notification to the user or manual controller.

**Fig.6. Temperature Sensor**

We have used LM35 as our temperature sensor in this study. The LM35 is associate degree computer circuit device, which will be accustomed live temperature with associate degree electrical output proportional to the temperature.

### D. Sound Sensor

Sound is an important parameter for the condition monitoring of machines and their elements. In operation, sound is always present at the motoring system. The level of noise usually increase with deterioration in the condition of the motor are detected by using sound sensor.

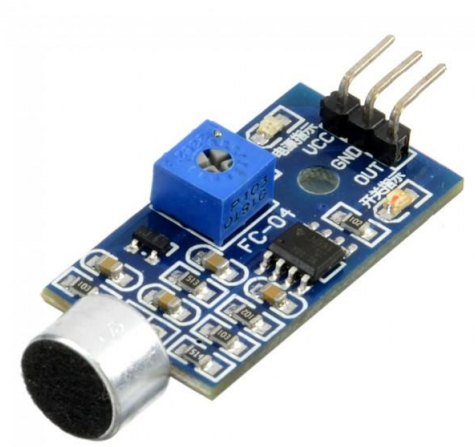


**Fig.7. Sound Sensor**

### E. LCD

The sensor will measure the data from the environment and the Data that are collected will be sending to the receiver. The data that has been read will be displayed on the LCD screen.

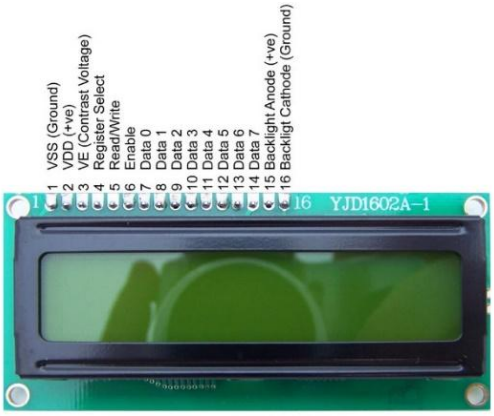


**Fig.8. LCD**

### F. GSM

GSM (Global System for Mobile Communication) is a public service available at no cost to the user. Nowadays mobile handset is not new to the user.

**Fig.9. SIM800 GSM Module**

Everywhere user can be seen using mobile phones and they are very much conversant with mobile handset. There is no extra cost of communication equipment's. Using GSM technology, a motor can be controlled and monitored from every corner of the world. The GSM Modem is used to collect the information from microcontroller through MAX232 IC.

### G. Node MCU

The NodeMCU EPS is a wifi chip with a full tcp/ip stack and in the MCU the program can be uploaded. It is most suitable for IOT devices since it has an built-in support system for wifi connectivity and that makes the connectivity much easier. It consists of GPIO port similar to arduino and chip called EPS, digital IO pins and serial communication port and analog input and onboard reset button.

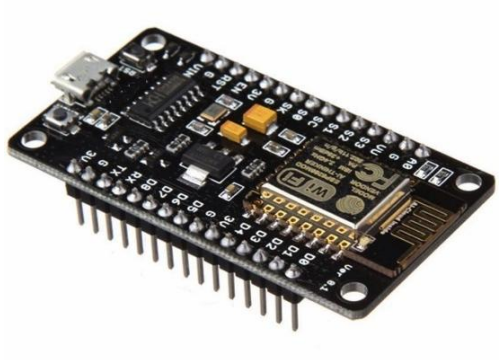

**Fig.10. Node MCU**

### H. Arduino Software (IDE)

The Arduino Integrated Development surroundings - or Arduino package (IDE) - contains a text editor for writing code, a message space, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to transfer programs and communicate with them.

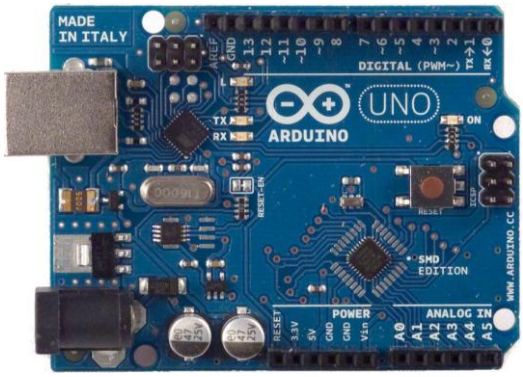


**Fig.11. Arduino Module**

## VI. RESULTS

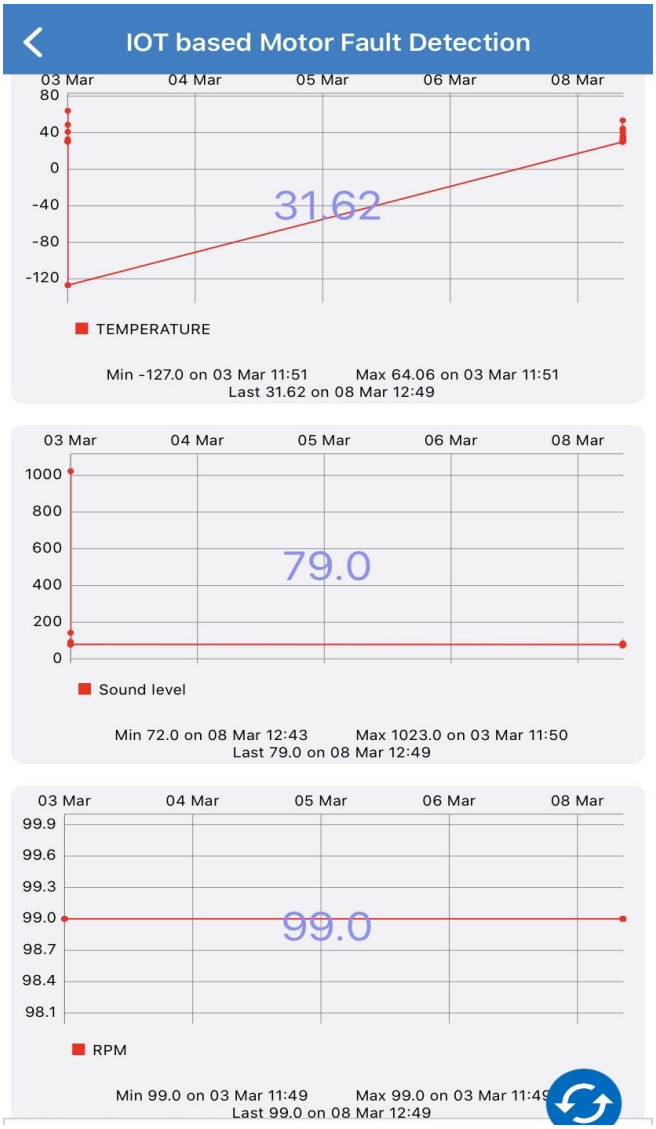


**Fig.12. Results of the output**

## VII. CONCLUSION

This project is based on the protection of motor and electronic device i.e, DC FAN under over overloading and it is implemented using controller, sensing circuits. The system is very cheap as compared to present day protective devices available. By using sensing circuits, we can monitor crucial parameters and these values given to controller. It is capable of performing some operations like running the motor through measuring, stopping it, monitoring and controlling all the parameters of the DC motor such as noise, temperature and speed.

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