

# Vibration Monitoring of Rotating Machine Using Arduino

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**Abstract**— In today's fast competitive business world manufactures are seeking every competitive advantage they mainly focus on increasing production and minimize cost while maintaining product quality. The identification of defect within machine, reducing failures and unscheduled down time is increasingly demanded of condition monitoring technologies. The purpose of the project is to reduce unscheduled down time to increasing productivity for this we are doing vibration analysis of the rotating machine. Here we are using accelerometer sensor for sensing vibration, collect data from mounting sensor stored in microcontroller. Arduino board consisting ATmega328p microcontroller sent signal to third party (pc, laptop) for further analysis. This module can be easily deployed for different rotating machine in industry

**Keywords** - IoT, Arduino, Arduino IDE, vibration monitoring, ADXL335, rotating machine

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## I. INTRODUCTION

Rotating machines are very common and widely used in today's industries. Some of these machines which are used in industry are very complex and critical for operation. When the motor works, it causes noise and the motor vibration which may affect product operation and quality. A vibration monitoring system is a set of tools which is used to measure one or more parameters in order to identify changes happen in the behavior of the machinery. In fact the main purpose of these systems is to help in scheduling and reducing the maintenance activities based on a process called Predictive Analysis.

Machine monitoring is the most widespread method which is used to determine the health of rotating machines. By doing so, we can prevent the frequent machine failure, repair or replacement costs, loss of production, quality problems also the environmental impact and other negative effects of deteriorating machine condition. Vibration monitoring process is mostly used for fault detection in rotating machines.

## II. Problem Statement and Targeted Output

### 2.1 Problem statement:

Now today's industries want quality, quantity product within minimum time, so continues monitoring play important role. In industry most of the machine are rotating so there is chances to occurrence of unscheduled

down time fault, major failure which effect on quantity of the product so we continues to monitor the vibration of rotating machine .

### 2.2 Targeted Output:

Our aim is to monitor vibration of rotating machines with the use of vibration sensor i.e. accelerometer and avoid the fault occur in industry.

## III. Literature Survey

We know that proper and reliable condition monitoring is required for effective operation of machines. It is very necessary to resolve different types of fault, defects, machinery problems etc.so that it is very necessary to have early fault recognition for the protection of different machines specially rotating machines.

But in case of airplane, power turbines, and other chemical engineering facilities, the condition monitoring become very difficult because we are unable to find out incipient faults in a very less time.so in that case vibration monitoring in such section is necessary to do proper effective operations of such rotating machines.

Vibration monitoring can help tremendously in detecting the fault and it is based on vibration signal and according to that we can find out the different types of faults.

Design of wireless sensor node for vibration monitoring of industrial machinery: From this paper we have noted that Accelerometers are electromechanical devices that convert the mechanical signals, such as vibration and

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force, to electrical signals. The major parameters which need to be considered for accelerometer selection are sensitivity, range, bandwidth, frequency resolution, reliability, accuracy, operation environment and cost.

International Journal of Instrumentation Science 2017: Development of smart sensing unit by embedded accelerometer with their International Journal of Instrumentation Science 2017 microcontroller: From this paper we have noted that Vibration is a mechanical oscillation around a reference point and defines the movement of a mechanical system the vibration is characterized by amplitude, speed, acceleration frequency spectrum. The impact signatures generated by a bearing defect are usually non stationary in nature and weak in magnitude, which are modulated by other rotary component.

Induction Motors Vibration Monitoring Using a Biaxial Optical Fiber Accelerometer: From this paper we have taken that the vibration measuring in induction motors can be used for fault diagnosis. One of the faults that can be diagnosed is the rotor broken bar. The rotor bars can be cracked, partially or completely, during motor operation. Once a bar breaks, the condition of the neighboring bars also deteriorates progressively and in order to prevent such a cumulative destructive process, the problem should be detected early as possible. When the motor runs with this failure some frequency components arise in the motor vibration spectrum.

Another is the by using International Journal of Instrumentation Science 2017 atmega328P , and ADXL335 Accelerometer is the main smart sensing unit is used for detection of the vibration of different rotating machines and LabVIEW software is used to analysis the different amplitude of vibration signals by using c program and with the help of 3 axis adxl335 smart sensor. In this way analysis of different types of faults ,malfunction defects in the machine can detected by using this technology od vibration monitoring of different rotating machines.

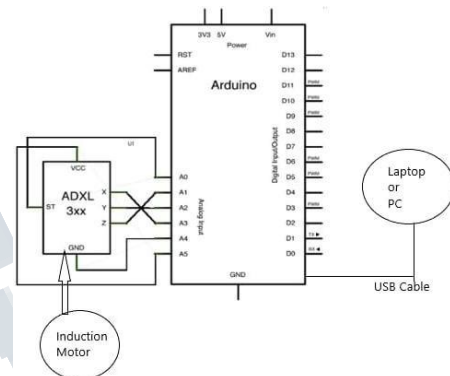
#### IV. Software

Arduino IDE is programming software for arduino. It is an open-source platform which is based on easy to use software and hardware. Arduino boards are able to perform different projects and applications. It is able to read inputs and turn it into an output. We can give instructions to board with the help of software and programming. Arduino IDE software has simple and easy user experience. It runs on Mac, Windows and also Linux. There are different download options and versions available on their official website.

With the help of latest version of software it is easy to program and perform projects. It also has options for different boards like NodeMCU, Intel Boards, etc. We can easily write program, compile and upload it to specific board.

There is also option for waveform in this software. So we can also see the waveforms of different applications or outputs in this software.

#### V. Circuit Diagram and Working



**Fig No 1: Circuit Diagram**

Circuit diagram shows the system design with the interfacing of sensor and arduino. The connection between Arduino and laptop or pc is also shown in this circuit diagram. There is induction motor shown in the circuit diagram for testing of system i.e. vibration monitoring.

Firstly we have to connect ADXL335 sensor to the arduino. Programming should be done in the software Arduino IDE. After writing and compiling program in software we have to upload it in the arduino board with the help of USB connection. We have to keep sensor on the motor to monitor the vibration. After that we can see the digital values of X, Y, Z axis of sensor on the software with the help of serial monitor option.

For the waveforms we have to use the serial plotter option. Through serial plotter option we can see the waveforms of the vibrations. We can see the vibrations on the laptop or pc with

the help of software. If there is any misalignment in the shaft axis or if there is any other fault due to which vibrations increase then we can see the change in waveform. This is how we can monitor the vibrations with the help of ADXL335 sensor and arduino board on the screen/Laptop/PC.

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### VI. Future Scope

The prototype can also implement using different communication and automation systems like PLC, NodeMCU, etc. WE can also implement this project in multimotor system where large numbers of motors are used.

In multimotor system we can get the data of vibrations in the form of waveforms on single screen for monitoring. This can help the industry to monitor vibrations of all machines on single screen. This system can also implement with the help of PLC. We can connect the sensor to the PLC and get the data with the help of SCADA system.

There is also scope in the IoT for this system. We can connect this system with the help of IoT and get the data of system on our mobile or screen which is in remote place.

### VII. Conclusion

Vibration monitoring is based on the accelerometer sensor i.e. ADXL335 sensor. With the help of arduino programming and sensor interfacing with arduino board we can monitor the vibrations of rotating machines. An actual prototype is designed and has proved the system being feasible. It can collect the data i.e. vibrations and display with the help of waveforms.

To fulfill competitive business demand with maintaining product quality we can do the vibration analysis using software and hardware. We can also reduce unscheduled downtime and defect in machine with taking correct action before any fault with the help of this vibration monitoring system.

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