

LASER BASED VIBRATION SENSOR THROUGH MOBILE

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ABSTRACT

Machine health monitoring is an important aspect in an industrial company. Machines have a certain period of life span and when a machine part starts to degrade and after its wear and tear period ends, it can cause major damage to machine. So, can we stop this from happening? There are some different types of vibration sensor in market, which are needed to be installed on sight. But our project is laser based vibration sensor which is contactless sensor because it uses laser to observe vibration readings. This is absolutely harmless to machine. And a mobile app is used to notify if there are a certain level of changes in vibration readings.

Keywords - vibration sensor, industrial, Smartphone, LASER.

I. INTRODUCTION

Vibration measurement using different signal processing with suitable set-up data is a powerful tool to identify and predict failure in machines. Conducting different Vibration analysis techniques could lead in improving machine life span. When a machine is having change in its vibrations that just means that it is soon going to be damaged so, Monitoring the vibration characteristics of a machine can provide the information of its health condition, and this piece of information can be used to detect problems that might be incipient or developing. There are two ways for analysis with contact and without contact here this project is based on non-contact analysis. To make this project non-contact, we used laser. Usually in the contact type vibration sensing, the sensor is attached to the machines or instruments in order to detect the vibration amplitude and frequency. In some applications where precise vibration measurement is required or in toxic and hazardous environment, addition of contact sensor becomes impractical due to inaccessibility or since this

attachment adds a mass on the instrument or the machine and might alter its vibration characteristics. But non-contact analysis is very cost effective and uses less manual power and also gives better results.

In industry, machine monitoring necessary so that every machine can function properly and do not affect the production of plant. This project gives the solution for this problem by checking vibration level of machine if vibration level increases it will give alert so that faulty equipment can be replaced on time.

II. PROBLEM DEFINATION

This project is based on non-contact vibration sensor for monitoring damage in industry machine. There are many industries that have costly machine and some of them are important for whole production plant. Monitoring machine in industry to avoid failure in machine functioning is very necessary. But monitoring machine through Traditional technique where monitoring system is formed using communication cables and various types of sensor is very costly and hard to maintain. To ease the work here, we are using vibration sensor. And we are also making database that include every machines detail present in industry so that if any machine exceeds their permissible limit vibration it can send notification through app to the concern person.

III. IMPLEMENTATION:

Components Used

- To measure vibration of the vibrating structure or machine part, a laser beam, reflecting surface, a linear gradient Glass film, solar cell and a Arduino is used.

Stage-01: Voltage measurement on solar cell

- A Reflecting surface will be planted on the vibrating structure, so that when laser beam hit, it gets reflected

towards the solar cell. The solar cell is coated with a linear Gradient Glass film, so when light hit solar cell, it will generate different voltages for different places hit by light.

Stage-02: Interfacing with Arduino

- The changes in voltage will be input to Arduino. And these inputs can be read by Arduino using function AnalogRead (). This function will be used to plot a graph of voltage vs. time. And for different values of voltage ranging 0 volts to 5 volts, it will show a values ranging a accuracy from a to 1023. I.e. having an accuracy of 5mV.

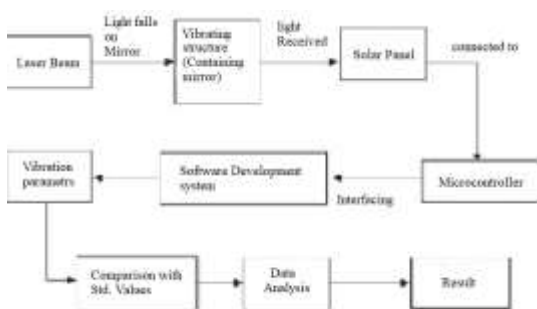


FIG 1. data acquisition system

The above image is flow of the project. The steps are taken out as the laser beam hits the vibrating object then reflecting light goes to the Solar panel and after that it sends voltage data to the microcontroller then microcontroller analyze vibration parameter then it displays vibrations of the machine.

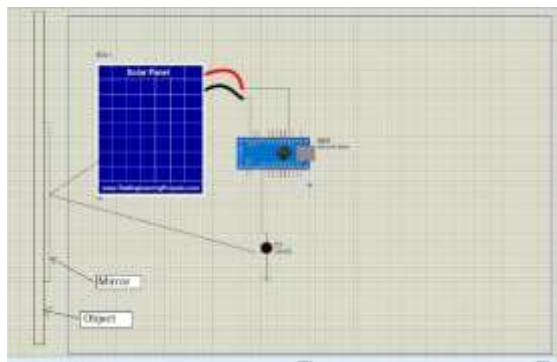


fig 2. Circuit Diagram

After the data acquisition system is ready, we combine that data with software development system so that it can give result accurately and then analysis is done using calibration with accelerometer

IV. WORKING

A laser source is used to impart on a part of working machine. A mirror will be glued to the machine part so that when laser beam hits the mirror maximum light is reflected towards the solar panel. As there are many light sources already present in environment so to eliminate unwanted light wavelength there will be a coating of a material that reflects back all other wavelength except the laser beam. So when laser beam hits solar panel there will be different voltage generation for different co-ordinates. These current readings are processed in microcontroller (ATmega328p). Then in the μC the data is calibrated to compare it with the standard data sheets. If the structure is working properly i.e. vibrations are as expected, than taking reading will be continued and if vibration readings exceeds there will some kind error prompt either by LED or notification sent to mobile.

V. EXPECTED OUTPUT

This project mainly focuses on contactless vibration sensor, so on completion it will cover its main objective where this sensor can be used in hazardous environment plants. As this sensor will have a Bluetooth shield module attached to it so it can send readings and alerts to concerned persons mobile phone. In terms of accuracy, as voltage is used to take vibration readings into account, it will have range of 1-1023 for a 0-5V voltage range. So, it will have a different value for every 5mV change.

VI. REFERENCE

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