

ONLINE VIBRATION MONITORING OF TRACK GRINDING MACHINE

Harshali .S.Narkhede*, Nikita .N. Chaudhari*,

Prof .H .P. Chaudhari**

*Student of BE, Department of Instrumentation and control, AISSMS's IOIT, Pune University, Maharashtra, India

**Head of the Instrumentation and Control Department, AISSMS's IOIT, Pune University, Maharashtra, India.

Abstract:

To increase reliability and quality of the product at low cost, machine must work without any failure. To avoid unplanned downtime due to sudden failure of spindles, condition monitoring is very essential. Condition monitoring is the process of monitoring a parameter of condition in machinery (vibration), in order to identify a significant change. This project focuses on the condition monitoring of spindle.

In this project changes in the machine conditions (vibrations) are detected automatically in real time by using online vibration monitoring system. If the spindle vibration increases quality of the product is affected. This system helps to overcome this problem Vibration measurement sensor (accelerometers) is mounted on spindle which is used to sense the vibration of a spindle .Data acquired from the sensor is collected by IMX-8, which is a vibration monitoring device used for continuous analysis and monitoring. It has different modes and on-board memory for local device data storage and data analysis via the app SKF @plitude observer. IMX-8 is connected to HMI through Modbus. The biggest benefit of Modbus protocol is that it supports communication speed up to 115 kbps. For human machine interface, Mitsubishi HMI is used to display the status of a machine.HMI screens are designed by using GT Designer-3 software which is used for continuous monitoring and graphical view of vibration.IMX-8 and GSM modem is connected through Ethernet which provides high speed data transmission. This acquired data can be accessed remotely by administrative office or clients.

Keywords: Vibration, Condition monitoring, spindle.

Problem statement

- Unplanned breakdown due to spindle failures.
- Production loss of channels.
- Sometimes incorrect machine setting leading to induce Vibration on the spindles. This resulted in high consequential costs.
- Scrap percentage was more due to spindle vibrations.
- Changes in grinding forces due to blunt wheel or dresser. It is not easy to detect such abnormalities.

The main Objectives of system are as follows:

- Vibration monitoring of track grinding machine.
- Reducing the machine breakdown time due to warning provided by online Vibration Controller.
- Provision of remote monitoring.

I.INTRODUCTION

A grinding machine is used for grinding. It is a process used to polish work pieces (bearing rings) that must show high accuracy and high surface quality. During the operation, various faults may arise. In these days of cut-throat competition one cannot afford to have luxury of losses due to communication issues, downtime of the machine, etc. These failures directly affect the production line which in turn leads to the damage of bearing rings. To avoid losses or fault, condition monitoring proves to be very effective to detect faults at early stages.

In this project,online vibration monitoring system is used to detect the faults at early stage. . Failure modes include unstable quality, misalignment, stiffness, Noise, vibrations, excessive force etc. Implementation of this online system provides:

- Real time machine health monitoring.
- Trigger before failure
- Deviations reported.
- Detailed analysis.

II SYSTEM MODEL

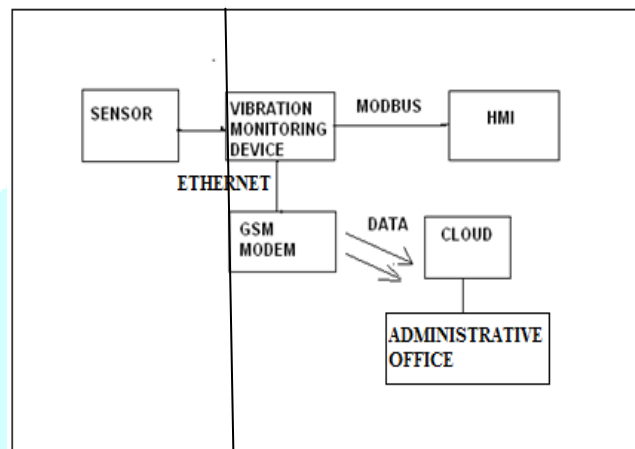


fig:BLOCK DIAGRAM OF PROPOSED WORK

This project is developed by using an accelerometer sensor which is used to sense the vibrations of a spindle which is a crucial part of track grinding machine. Product quality is maintained if the spindle vibrations are within safe limit(<4mm/s),as vibrations can be measured in terms of velocity. Sensor senses the vibrations and transmits the signal to the vibration monitoring device IMX-8. IMX8 is a vibration monitoring device with eight analog input channel and 2 digital input channel.It is designed for continuous analysis and monitoring. It provides the readings from the sensor via SKF@ptitude analyst application. For human intervention HMI is provided which implies the status of a machine to an operator with help of trends or graphical representation of data on HMI screen.HMI used in this project is manufactured by Mitshibushi. MODBUS is used to connect IMX-8 and HMI. The biggest benefit of Modbus protocol is that it supports communication speed up to 115 kbps.IMX-8 and GSM modem are connected through Ethernet. Ethernetprovides high speed data transmission. All the data is stored in SKF cloud which can be accessed through SKF administrative office.

III.RESULT

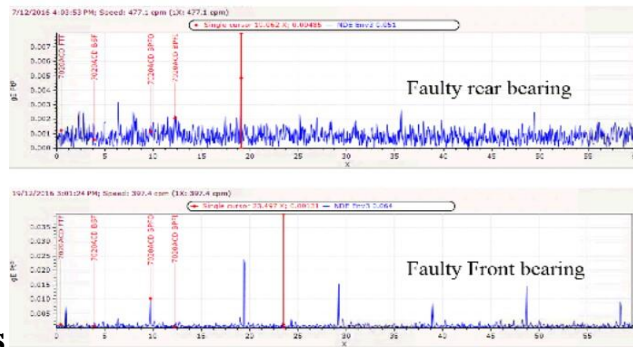
Vibration monitoring can be performed on load conditions as well as on no load condition without manual intervention. Man hours are saved. Delivery lead time to customer increase. Same machine now can produce 3600 rings/month. Hazard of accident has been eliminated while taking readings on the running machine manually therefore safety issues can also be eliminated.

Following are the results of proposed work:

VIBRATION MONITORING SYSTEM - SGB 55B

| POINT | mm/s RMS | gE |
|--------------------|----------|------|
| Grinding Motor NDE | 2.67 | 0.87 |
| Grinding Motor DE | 0.91 | 0.48 |
| Dressing Arm | 1.48 | 0.00 |
| Workhead Motor NDE | 1.07 | 0.16 |
| Workhead Motor DE | 1.96 | 0.47 |
| Workhead Spindle | 0.13 | 0.36 |
| Gr Motor Current | 25.21 A | |
| Clamping Pressure | 0.04 Bar | |

Frequency spectrum comparisons



Above screens of HMI illustrate result of proposed work in project.

Vibrations of grinding motor were 2.87 mm/s. when system was not installed and when system installed vibrations reduced to 0.87 ge.

IV.CONCLUSION

- Preventive:
- Early recognition of spindle vibrations avoiding unplanned breakdown.
- Process monitoring:
- Critical parameters like dressing conformation can be monitored.
- Calibration free due to integrated self test. Provision of alert and danger alarms due to which spare spindle can be arranged in advance before failure.
- Safety: Safety is increased as hazard of accidents has been eliminated while taking reading on the running machine manually.
- This proposed system enables the real time machine monitoring and detailed analysis. Same machine now can produce 3600 more rings/month.

V.ACKNOWLEDGEMENT

Inspiration and guidance are invaluable in every aspect of the life, especially in the field of the academics, which we have received from our respected project guide **Mr.H.P.Chaudhari, Head of department (AISSMS IOIT, Pune).** and **Mr .S. M. Nimbalkar, deputy manager (SKF, Pune.)** We would like to thank as they were responsible for the complete project and also for his endless contributions of time, efforts, valuable guidance and encouragement he has given to us.

VI.REFERENCES

- [1].Yonghuihu, yang yan fellow, IEEE, LijuanWang, and Xiangchen Qian"IEEE sensor journal", Vol16, No: 10, May 2016.
- [2].Julian Turner,"Effects of Data Centre Vibration on Compute System Performances",
- [3].Thomas.l. Paez Consulting, Durango Colorado "Sound and Vibration Journal", 2012.
- [4].G.S.Yadava,S.Saravaman, P.V.Rao,"International Journal of Advanced Technology"July 2006.
- [5] SKF"IMx-8 user manual."
- [6] SKF "CMSS 2100 accelerometer sensor datasheet."