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Industrial IoT based iLens Condition Monitoring System for Bearing Performance in Terms of only Temperature Parameter

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Abstract:- The Internet of Things (IoT) concept facilitates our life in many areas. One of the facilities provided in this area is undoubtedly condition monitoring. Unlike regular maintenance, IoT systems that perform continuous control operations can provide great advantages to the company with a warning that a serious failure will occur. It is a vital importance to determine defective bearings during the rotation of the power generating and power consuming machines without reaching the critical level.

In this study, a setup was created, in two bearings (Driving end and non-driving end) of a coal screening machine and a Condition Monitoring (CM) was performed in the industry environment which could monitor temperature for defective bearing detection. Challenges: We cannot monitor vibration and acoustic parameter because of huge fluctuating vibration and noise of the coal screening machine. Also, we cannot use contact-less/infrared temperature sensors due to full of dusty environmental air.

Keywords:- *Internet of Things, Condition Monitoring, Machine Learning, Bearing, Coal screening, iLens.*

I. INTRODUCTION

Bearings are one of the most critical components in every rotating system because they hold rotating shafts. Bearing defects for small and medium-sized machines account for most of all defects [1]. Preventing possible failures is very important in terms of reducing economic losses and the safe operation of industrial facilities. That is why condition monitoring of the Bearings is crucial [2].

II. MATERIALS AND METHODS

Condition Monitoring System consists of three parts; first one is setup for the experiment, the second one is the Condition Monitoring (CM) that runs on python system to visualize the data, the third one is cloud system that used for storing the data to analyze. The setup consists of a iLens Edge Device unit and two NTC100K thermistor. CM was created with a program called CSV Grapher.

III. SETUP

First step is to put NTC100k Thermistor to the bearing's lubrication hole. That will sense the temperature of the bearing's inner part. Two temperature sensors for two bearings one is driving end side bearing, another is non-driving end side bearing. Next step is to connect those temperature sensors to the iLens edge device. iLens edge device will collect temperature data of both bearings and send it to the cloud server by TCP IP.

IV. RESULT

After Analysis of few days data assumed that the upper threshold value of the driving side bearing temperature should be 70C and Non driving should be 60C for optimal condition of the bearings and machine (Figure 1). Generally driving side bearing have more stress than non-driving side bearing due to power transmission. Now set a notification for these threshold value to a mobile device.

After running of this system for few weeks got a notification for non-driving end bearing temperature (Figure 2). and noticed that non-driving side bearing temperature is going higher than normal condition. After plotting the graph of both bearings' temperature noticed,

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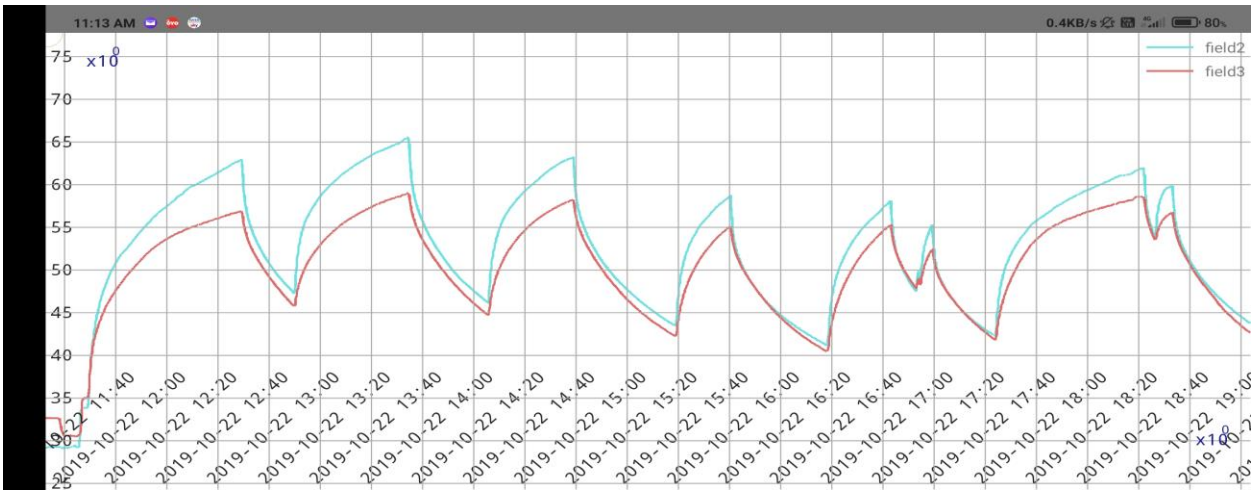

Figure 1: Blue line is showing Driving end side bearing temperature, and red line is showing non-driving end side bearing temperature. Noticed threshold value for both bearings' temperature.

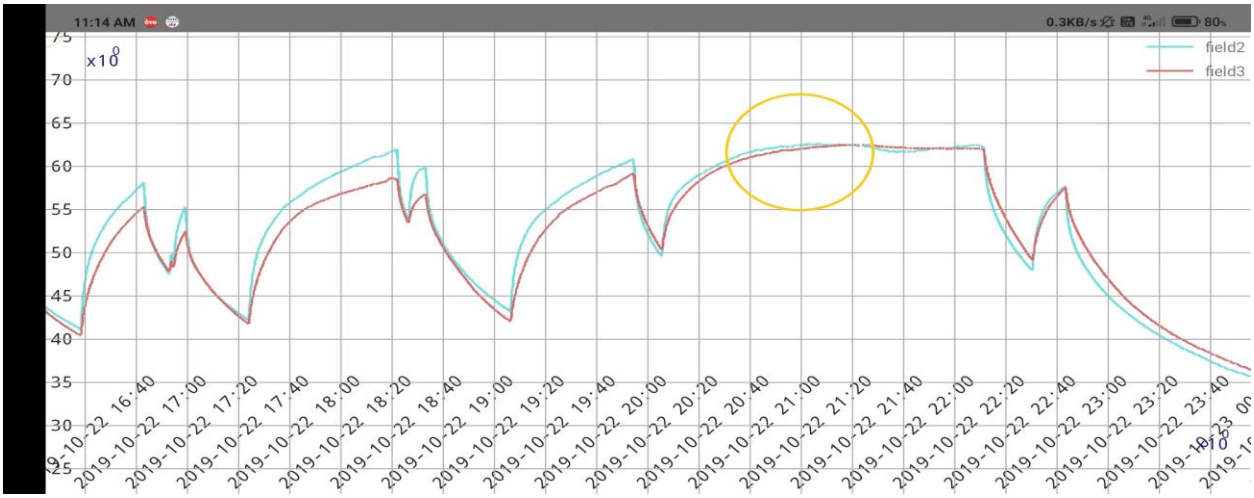

Figure 2: Noticed Non-driving side bearing temperature is behaving abnormally, crossing threshold value.

Now system can predict that the non-driving side bearing is going to be damage after few days. And noticed that non-driving side bearing is getting hotter than driving side bearing temperature (Figure 3).

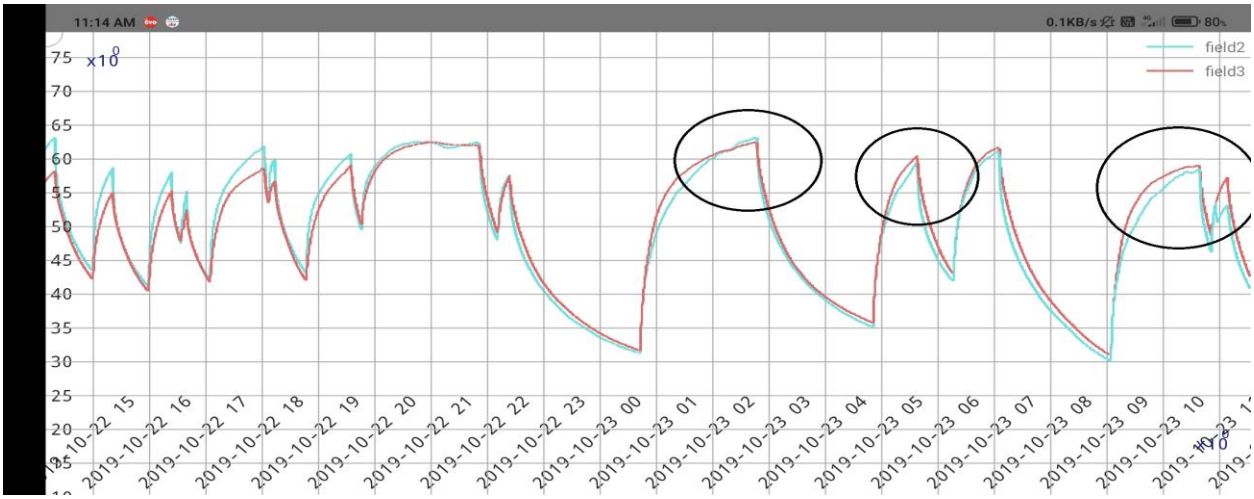

Figure 3: Non-driving side bearing is getting hotter than driving side bearing.

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Maintenance team and machine operators fond that there is huge friction in the non-driving side bearing for that reason it is getting hotter than the driving end side(Figure 4).

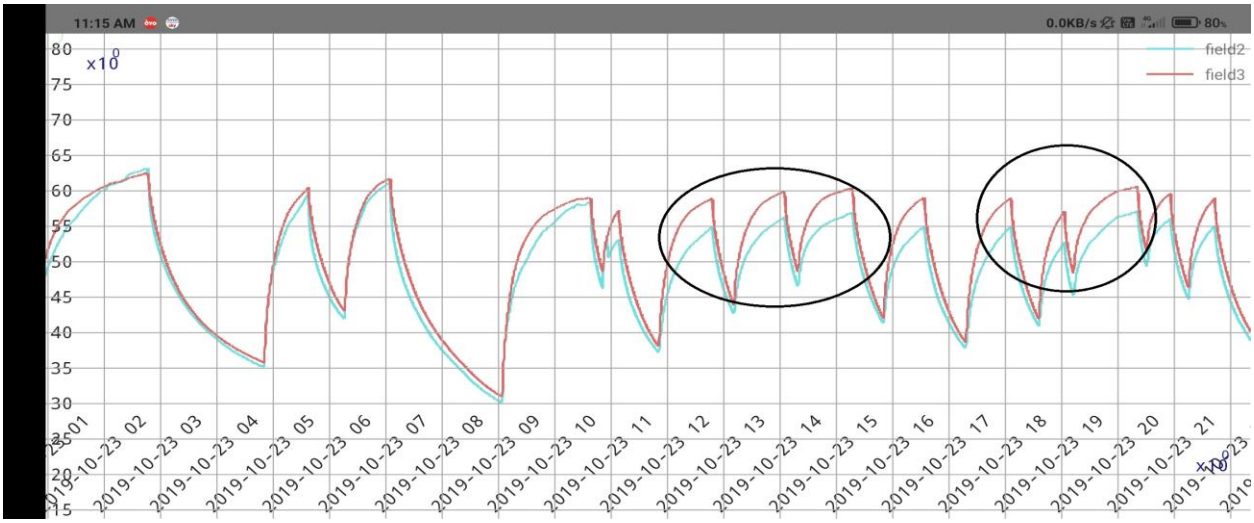

Figure 4: Temperature is increasing time to time because of friction in non-driving side bearing.

Maintenance team found a scrap metal inside the lubricant of non-driving side bearing and they cleaned it. After maintenance now the machine is running in its optimal condition.

V. CONCLUSION

IoT condition monitoring system prevents the bearing from failure by only monitoring the temperature data of the bearings. Now system can predict the health of the bearings and reduce downtime of the coal screening machine.

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