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Failure Analysis through the Vibration Monitoring on the Rotary Machine

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Abstract. This study is a study on fault diagnosis using vibration sensor for failure analysis of rotating machine such as pump and motor. It is a system that predicts the failure of the rotating machine in the frequency band by analyzing the velocity value and the acceleration value by FFT processing the numerical value obtained from the vibration sensor attached to the rotating machine. It shows the usefulness of the developed system through applied examples. Especially, this study is about the Sensor network for fault diagnosis

Keywords: Rotary machine, Vibration sensor, Sensor Network, FFT, Reliability

1 Introduction

Using IoT, we monitor the status of various devices used in petrochemical smart factories in real time and apply conservation methods. The goal of this technology is to process sensor data. (acceleration sensors, lubricant contamination sensors, etc.) monitored by various sensors in petrochemical smart plants through a central monitoring system using LTE communication networks for real-time maintenance. In addition, petrochemical smart plants are managed through company-to-server communication and companies are managed in a dual way. In particular, we use Big Data to manage safety more efficiently. We develop a petrochemical smart plant rotation facility safety management system that uses IoT, which is a fusion of facility safety technology that can process and control various data required by petrochemical smart factory. Especially, this study is about the Sensor network for fault diagnosis.

2 Sensor Network

The existing 1: 1 correspondence sensor data driver module performs localization of the form that can receive four sensor data. This saves the cost of connecting work

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cables and reduces the acquisition device by a factor of 4, rather than a 1: 1 response. The characteristics of collection and transmission are as follows.

The existing major product types are only capable of processing vibration and temperature data, but the product to be developed will be modularized and detachable so that the main sensor data used in the smart factory can be processed.

Fading occurs because the path of the direct, reflected, and diffracted waves between the transmitter and the receiver changes with time. It is the main cause of radio wave attenuation. When a fading phenomenon occurs, the size of the signal instantaneously becomes small, and the signal of the pointer is not recognized.

In the petrochemical smart factory, it is necessary to secure frequency resources for communication, improve the application of wireless communication technology, and develop devices for wireless communication in a smart factory.

As a solution for this, it is necessary to secure reliability for wireless communication.

Through the sensor network technology, the suitability of arrangement of each sensor drive is considered through optimization of reception ratio, signal strength, and the like. Optimized MESH algorithm technology is applied through wired and wireless integrated network.

The sensor is attached to the drive and the sensor attached to the rotating device by wire, and the sensor drive and the safety management system server are configured by wireless communication. The figure shows the block diagram of the developed sensor drive and the contents of the main board.

Although the performance is excellent in an environment without an obstacle, it is necessary to prevent the transmission of data from being broken in an obstacle section. In environments with many moving objects, such as petrochemical plants, it was difficult to ensure continuity of data by obstacles. To overcome this, LTE-based equipment was developed. [1]

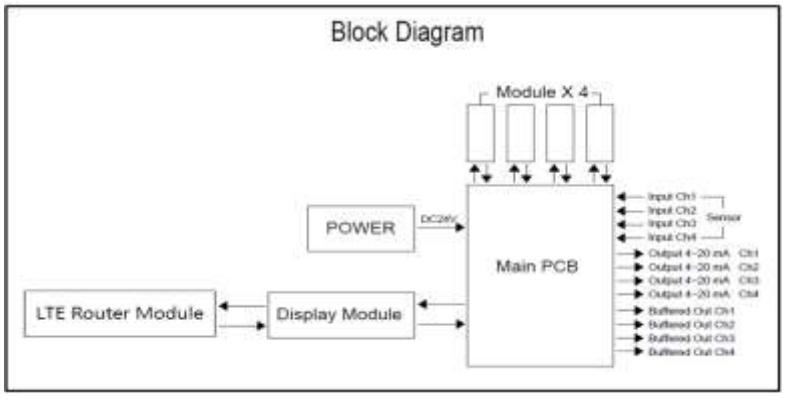

Fig. 1. Block Diagram of the Sensor Drive

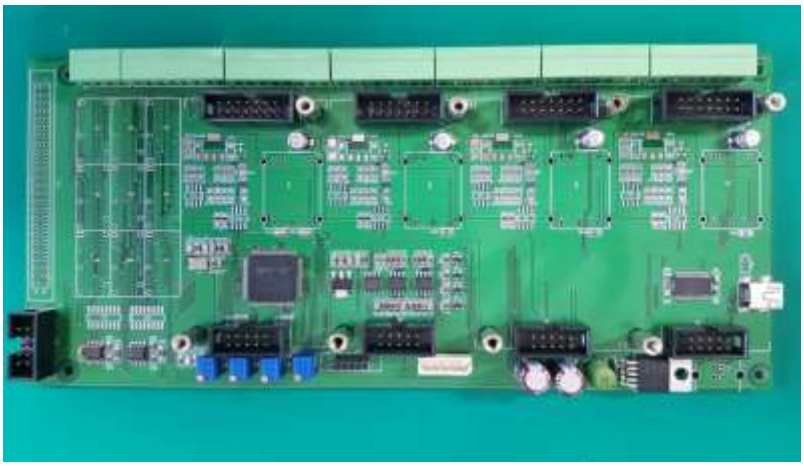

Fig. 2. Sensor Drive Main Board PCB Front

3 Test

Experiments were conducted at a straight-line distance of 20 km for the remote wireless LTE communication test.

Fig. 3. Long-range LTE communication test results. The light blue graph display is the silver upload data. The green graph display is download data.

I set it to send the overall value once every 2 seconds, and I was able to confirm that the data other than the overall data was coming up. The cause is that the background data of the PC itself uses the data. When testing in-house, the laptop did not have enough background data as it was not long before it was purchased, but the distance test did not work properly due to background data. The data measurement program used in the past was a program for measuring the data used throughout the PC. We rerun the experiment using the WireShark program to measure only the amount of data used for the IP connected to the instrument. Based on the traffic experiment using the WireShark program, estimating the monthly data yields a data

amount of about 0.28 GB. Even if the overall value is transmitted per second, if the transmission period of the FFT having a large data amount is set long, it is confirmed that even if the communication method is advanced to LTE, the cost burden is not large. [2]

4 Conclusion

Especially, this study is about sensor network for fault diagnosis. The results of this study are based on the growth engine through the export of intelligent factory automation technology as well as the increase of the manufacturing industry by creating new manpower demand to manage and operate smart factory system. Open source common software platform for smart factories and open source hardware digitization can provide various solutions by replacing the common process parts of various factories with production items, and it is possible to maximize the universality by creating various hardware digital libraries and modularizing them.

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