

920 MHz Band Wireless Online Condition Monitoring System

1. Introduction

Online condition monitoring systems are systems that monitor rotating mechanical equipment while in operation using vibration sensors, etc., and perform early detection and diagnosis of equipment abnormalities.

In system introduction, it is necessary to attach vibration sensors to the monitoring targets and install signal cables to the measuring device. However, in cases where the cost of wiring construction was high because the monitoring targets were scattered over a large area, or wired construction would be difficult because the monitoring targets were moving objects, introduction was difficult due to economic or physical constraints¹⁾.

Therefore, JFE Advantech Co., Ltd. developed a wireless online condition monitoring system that achieves cableless monitoring by wireless signal transmission and use of battery-powered equipment. This article presents an overview and the features of the developed system.

2. Overview and Features of Developed System

2.1 Configuration of Wireless Online Condition Monitoring System

The wireless online condition monitoring system consists of vibration sensors that measure vibration, wireless units that transmit the measured data as wireless signals, gateways that convert and transmit the wireless signals as Ethernet signals, and an online station that automatically collects the measured data and performs signal processing and integration processing, and also serves as an operation terminal for data storage and display. An example of the system configuration is shown in Fig. 1.

This system coexists with the conventional wired system, and data can be managed in an integrated manner.

2.2 Wireless Network and Wireless Units

2.2.1 Wireless Network

The wireless transmission frequency used in the system is the 920 MHz band, which became available for use in 2012 and has now expanded to commercial IoT applications. In comparison with the 2.4 GHz band widely used in WiFi, the 920 MHz wireless band has superior radio wave wraparound characteristics, enabling signal transmission even where obstacles exist. In unobstructed areas with a clear line of sight, long-distance transmission up to a maximum of 1 km is also possible. In addition, because the frequency band is different from the 2.4 GHz band which is widely used by many devices, the 920 MHz band has the advantage of being relatively unaffected by radio wave congestion.

2.2.2 Wireless Units

Wireless units perform primary processing of signals measured by the vibration sensors, converting those signals to wireless signals. Because the sensors use a separation system connected by cables, a good signal

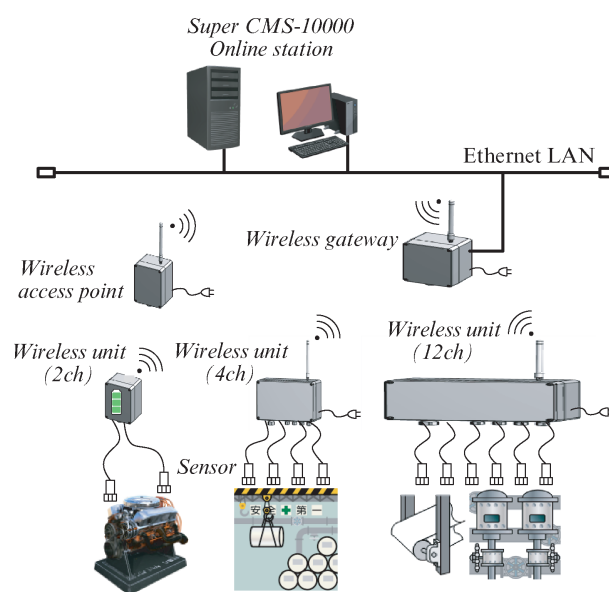


Fig. 1 Configuration of wireless online condition monitoring system

[†] Originally published in JFE GIHO No. 56 (Aug. 2025), p. 97–98



Photo 1 Wireless unit

transmission environment can be secured even in areas with complicated measurement points, by installing the wireless unit in an open area.

Photo 1 shows the appearance of the wireless units. Three types of vibration sensor input to these wireless units are available, 2 channel inputs, 4 channel inputs and 12 channel inputs. When using the 4 ch and 12 ch input units, temperature sensor signals and analog signals can also be input in addition to vibration signals.

These units perform signal processing such as filtering and integration processing of vibration signals to generate the acceleration, velocity and displacement signals necessary in condition monitoring and diagnosis. Since two-way communication with the host computer is possible, the system also supports FFT (Fast Fourier Transform) processing based on the alarm issuance and user's instructions and trigger measurement and continuous measurement in response to equipment operation. For FFT processing, a frequency analysis function with a maximum analysis frequency range of 20 kHz and maximum analysis resolution of 800 lines is provided, enabling cause analysis of vibration abnormalities.

Changes in the operational settings of the wireless devices and updating of the firmware are also performed from the host computer.

2.2.3 Drive Power of Wireless Units

The drive power source of the wireless units is the internal battery type for 2ch specification units and externally supplied power for the 4ch and 12ch specification units. The optimum drive power method for wireless units can be selected according to the importance of monitoring target and economic considerations. For example, an external power supply is selected in case of continuous measurement, measurements with a short measurement cycle, and trigger

measurements activated by equipment operation, and an internal battery type is selected when the measurement cycle is 1 time/day.

2.2.4 Wireless Access Points

Wireless access points are units that perform a relay function when direct wireless connection of the wireless units (sub units) with the wireless gateway (main unit) is not possible. Because relays with a maximum of 7 steps are possible, enabling connection of widely-separated wireless units, a wide-area system configuration is possible.

It may be noted that externally-powered wireless units are provided with a relay function similar to that of wireless access points.

2.2.5 Wireless Gateways

Wireless gateways perform relay processing, mutually converting the 920 MHz wireless transmissions of the wireless units and the Ethernet signals of the host computer.

2.2.6 Online Station

The online station displays alarm information, data for vibration value trend management, FFT analysis results, etc., and judgment levels for issuing alarms can also be set.

3. Deployment of Wireless System

3.1 Connection with CU-30000/CU-30000HG

Wireless compact monitoring units (CU-30000/CU-30000HG), in which the functions necessary in vibration monitoring are concentrated in the unit itself, have also been added to the line-up. These units make it possible to introduce simple, quick wireless vibration monitoring, while securing data confidentiality and extensibility.

3.2 Connection with Other Systems

3.2.1 Data Export by CSV File

Measured data and setting information such as alarm judgment levels can be output automatically from the online station in the CSV file format. Integrated management with other data accumulated in the host computer is also possible by access from the host computer.

Use of JFE Advantech's dedicated software enables direct automatic outputting of the measured data from the wireless gateway as CSV files, and wireless vibration monitoring of other systems can be achieved simply by incorporating the output CSV data in other systems.

3.2.2 Linkage with PLC

Vibration data can be incorporated directly into the PLC by connecting the PLC with the wireless gateway by Ethernet signals. This allows management of the vibration condition of equipment without using the dedicated CMS software.

3.3 Explosion-Proof Wireless Unit

An explosion-proof specification wireless unit was developed, received certification as an intrinsically-safe explosion-proof structure for Zone 2 hazardous locations, and begun its sales. A wireless access point with an increased safety explosion-proof structure corresponding to Zone 2 is also under development, and will enable relay in hazardous locations where use had been difficult until now.

4. Conclusion

The overview and features of the JFE Advantech 920 MHz band wireless online condition monitoring system were introduced. By enabling application of vibration monitoring to equipment where introduction had been difficult with the conventional technology, this system is expected to make an important contribution to advanced equipment management.

Reference

- 1) [Wireless Sensor Type Condition Monitoring System. JFE-Giho. 2015, no. 35, p. 72–73.](#)

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