Latest Online Machine Diagnosis System "Super CMS-10000"[†]

1. Introduction

Online machine diagnosis systems have been introduced in diverse industries as condition monitoring and diagnosis tools for rotating machinery, and have provided substantial benefits to users.

On the other hand, more advanced analytical information has become necessary in maintenance activities in steel, paper, petroleum, chemical, and other plants accompanying recent progress in processes and machine structure, such as higher speeds, introduction of inverter control, miniaturization, and the like against the background of higher working ratios and energy saving.

This report introduces the latest online machine diagnosis system, "Super CMS-10000" (hereinafter, new system), which provides advanced diagnostic and analytical information.

2. Outline of New System

An example of the configuration of the new system is shown in **Fig. 1**.

The basic function of the new system is equipment diagnosis by the vibrating method for rotating machinery. This basic function can be broadly divided into 3 functions: (1) Sensing function for automatic collection/ measurement of data using vibration pickups and other sensors, (2) Condition monitoring function which automatically judges changes in equipment condition and whether anomalies exist or not using the collected/measured data, and (3) Precision diagnosis function which



Fig. 1 "Super CMS-10000 System" configuration

analyzes the frequency of the vibration signal when an anomaly is judged to exist and automatically diagnoses the cause of the anomaly. In the new system, these functional elements are organically linked via a network.

3. New Functions and Features of New System

3.1 Advanced Condition Monitoring and Analysis Performance

3.1.1 Real time vibration measurement and data logging

It is possible to measure vibration in real time and record that data for a period of several months (**Fig. 2**). Advance prevention of sudden failures by successively evaluating the vibration behavior of key equipment during operation is one essential function of the system, and in the unlikely event of a sudden failure, the system is capable of quickly and accurately investigating the cause by tracing historical real time data back into the past.

3.1.2 Advanced anomaly detection logic

Introduction of advanced anomaly judgment logic such as automatic trend judgment of changes in rising measured values in short- or long-term time units, automatic mutual comparative judgment of conspicuously high points when measured values in some unit of



Fig. 2 Vibration real time data display example

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equipment in the same group, etc. has made it possible to detect the initial stage condition of anomalies accurately and at an earlier timing, for example, in detection of rising trends which have not yet reached the alarm level.

3.1.3 Condition monitoring of variable speed rotating machinery

In order to quantify the condition of equipment accompanying changes in rotational speed, two corresponding functions are provided, these being a layered control function in which vibration values are controlled individually in accordance with the condition of rotation at the vibration measurement point, and a correction control function which automatically analyzes the correlation between the actual measured vibration value and the condition of rotation and corrects the vibration value based on the results.

These functions have enabled more accurate anomaly detection by eliminating the influence of changes in the equipment operating condition.

3.1.4 High performance online analysis function

Necessary and sufficient analytical performance was achieved, including side band analysis of reduction gears using a high fast Fourier transform (FFT) analysis capability with a maximum of 51 200 lines, vibration phase analysis of multiple measurement points, etc., thereby realizing an automatic diagnosis function which includes automatic precision diagnosis when an anomaly is detected.

An online analysis function is now possible in which



Fig. 3 Online analysis feature

these functions, that are comparable the high performance analytical devices, can be executed freely from computer terminals connected to the network (**Fig. 3**), and immediate diagnosis can now be performed more efficiently and accurately when an anomaly occurs.

3.2 Effective Utilization of In-house Infrastructure Environment

3.2.1 Web remote access function

The anomaly information of the new system can be confirmed and analytical operations can be performed easily by remote access from existing office computers using a web browser.

Control can be strengthened by sharing information on occurrences of anomalies between managers, the maintenance division, the operating division, and other related divisions.

3.2.2 Email notification function for anomaly information (advance signs)

Email notification of anomaly information (advance signs) makes it possible for persons in charge of maintenance and operation to check the occurrence of anomalies anytime, anywhere using office computers or cell phones. This enables early response for advance prevention of malfunctions.

3.3 Reliable System Management Performance

An advanced management function is provided for the automatic detection functions for trouble in sensor and system equipment, action after detection of trouble in those items, and the status of countermeasures, etc. As a result, maintenance control work related to system performance can be performed easily and reliably.

3.4 High System Expansibility

3.4.1 Daisy chain wiring of vibration pickups

The daisy chain wiring connection method can be applied to vibration pickups.

3.4.2 Multilingual system

In addition to Japanese, display switching among diverse languages, including English, Chinese, Korean, and others, is possible on the operation terminal, enabling easy introduction of this system at plants in other countries.

4. Conclusion

A brief introduction of the outline of the new online machine diagnosis system and the features of the most recent model were introduced.

In the future, JFE Advantech will actively grapple

with a number of issues in order to contribute to increased business efficiency for its clients as a machine diagnosis system maker.

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