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APPLICATION OF TIME FREQUENCY TECHNOLOGY TO FAULT DIAGNOSIS OF ANTENNAS ON VESSEL

Abstract

In order to solve the problem that antennas on vessel easily occur machinery fault, fault monitoring and diagnosis system based on existing IP network and satellite communication technology is designed in this paper. Principles of time-domain statistic analysis, Hilbert envelope spectrum, Hilbert-Huang transform, translation-invariant multi-wavelets denoising using neighboring coefficients, are analyzed and used to location diagnosis of failure for satcom antenna. Application results show that these time-domain and time-frequency domain vibration signal processing methods can successfully point out the failure location of drive mechanism for satcom antenna on vessel.

Drive mechanism of the antennas on vessel is composed of engine, decelerator, gear case, gear, bearing, etc. At present, hearing by ear, looking using eye and feeling by hand are used to cursory find out the status of the antennas. Inchoate and latent failures can hardly be discovered. Evolution of the failure can barely be forecasted, leading malignant accidents caused by drive mechanism of the antennas frequently occur. And hence, existing IP network and satellite communication technology on the vessel, combined with subminiature sensors often used in the industry, such as sensors of vibration, ultrasound, temperature, humidity, stress, speed, etc, are recurred in this paper to construct three-dimensional sensor arrays and remote fault diagnosis system for the purpose of quantificational diagnosis and predictive maintenance.

The distributed fault monitoring and diagnosis system is composed of sensors, slave PC, master PC & web/database server, User's PC, IP network and satcom channel. Monitoring and diagnosis software is based on Windows NT. Interface is compiled using commonly used Labview. Complex algorithms are compiled by visual C++ into dynamic link library for use and adapting to changes of program environment. The distributed fault monitoring and diagnosis system on vessel sends diagnostic information to remote land users through firewall, privacy machine, router and satcom channel.

Time domain and time-frequency domain signal analysis tools are used to fault diagnosis of drive system for satcom station on vessel. In practice, damage on the sun gear of azimuth 1# decelerator is successfully diagnosed, which proves effectiveness of time-frequency technology to failure diagnosis of antennas on vessel.