Experimental Device for Machine Condition Monitoring with Oil Sensors in Construction Equipment

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Machine condition monitoring with oil sensors has two advantages over other machine condition monitoring. First, this method can notice at the early stage of fault condition by detecting wear particles with wear debris sensor. Therefore, it provide early warnings in the failure process. Second, it is convenient and effective to analyze data regardless of measuring time. Machine condition monitoring system need in construction equipment in order to improve reliability of the machine. Experimental device built to conduct various tests with oil sensors under several working condition. The monitoring system with diagnosis algorithm developed for hydraulic oil in construction equipment.

Keywords : construction equipment, machine condition monitoring, oil sensor

1. Introduction

Machine condition monitoring has become essential in maintaining and extending the health of high speed rotating and reciprocating machinery used in many of the nation's key industries including aerospace, manufacturing and energy [1]. Lubricating oil analysis has become an effective method to provide early warnings in the failure progressing because it contains valuable information regarding the aging and damage of oil-wetted moving component. [2]. Oil sensors used to monitor machine condition in various mechanical system such as aircraft, wind-turbine, engine, armoured vehicle and so on. Machine condition monitoring system with oil sensors also need to improve reliability and ensure the safety of long-life operation in construction equipment. In this research, experimental device established to test various oil conditions under several working conditions. Moreover, diagnosis program also developed to monitor condition of hydraulic oil in construction equipment.

2. Methods

In order to test of hydraulic oil in construction equipment, we select several integrated oil sensors as shown in Table 1.

Table 1: Oil sensors

Oil sensor model	Measuring items
LDH 100	Temp., Relative humidity
Contamination monitoring sensor 2	Temp., Relative humidity, Contamination
TE FPS 2800	Temp., Absolute viscosity, Density, Dielectric constant
Hydac HLB 1400	Temp., Relative humidity, Electrical conductivity, Dielectric constant
Ulfa Oil-Mon sensor	Temp., Relative humidity, Contamination, Oxidation

2.1. Experimental device

We build an experimental device in order to monitor oil condition with variation of water and ferrous wear particles as shown in Figure 1. Moreover, heater install to control temperature of hydraulic oil. Electrical devices modularize for convenience of research.

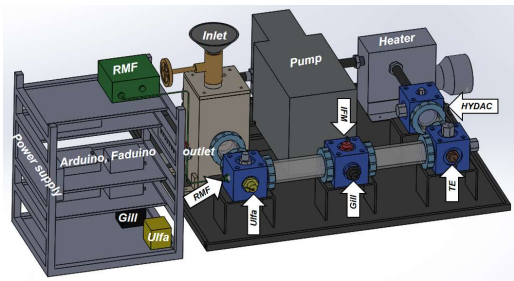

Figure 1: Schematic of experimental device

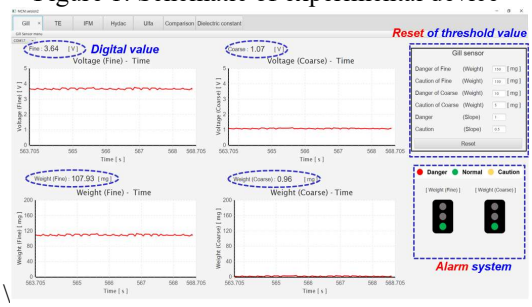

Figure 2: Diagnosis program

3. Results

We built an experimental device to monitor condition of hydraulic oil in construction equipment. Diagnosis program also developed to check oil condition as shown in Figure 2. Each sheet configured for each sensor to show the date, and there is a warning system through the threshold values. Moreover, it can check how the degree of contamination or dielectric constant changes with variation in other properties such as water content.

4. References

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