STUDY OF FAULT DIAGNOSIS OF MACHINERIES USING VIBRATION AND OIL ANALYSIS

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(09/8614)

Degree of Master of Engineering

Department of Mechanical Engineering

University of Moratuwa

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Dissertation submitted in partial fulfillment of the requirements for the degree Master of Engineering in Mechanical Engineering

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Declaration

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Abstract

In today's competitive Industrial environment, it is essential to achieve maximum availability of plant and machineries. The industrial equipments are subjected to a wide range of operating conditions and therefore the possibilities break down due to various inaccuracies and problems are quite significant. Therefore, a dynamic, predictive maintenance system based on machinery problem diagnosis is a must in ensuring a trouble free operation. While there are many methods of machinery fault diagnosis two of the most effective methods are vibration and oil analysis. Thus, the main objective of this research is to study vibration and oil analysis which predict the condition of the machines.

The accurate measurement and correct interpretation of vibrations can help in precisely diagnosing machinery problems. Both, overall vibration and spectrum of vibrations are interpreted to find the faults of the separators at Kelanitissa Power Station of Ceylon Electricity Board. During normal machine operations small wear debris particles are generated. When abnormal wear begins, large debris particles are produced and the particle size and concentration increase gradually until the machine fails. Therefore, continuous monitoring of wear debris and critical lubricating oil properties are inspected to prevent catastrophic system failure of machines.

Experimental analysis showed similar vibration results for both machines. Even though, the level of overall vibration exceeded used standard level, the machines are running well. Furthermore, the spectrum diagram of vibration shows some root cause which can be lead to failures in the future. In this stage, there is no sign of abnormal wear in the machines with the results of oil analysis. The principal conclusion is that both vibration and oil analysis techniques should be continued with some modifications to the time interval of oil analysis. Accurate prediction of prior notices of danger of failure could be expected with further collection and analysis of oil and vibration data.

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A.P. Sampath

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Abbreviation	Description
ASTM	American Society for Testing and Materials
CBM	Condition Based Monitoring
DC	Direct Current
DUT	Device Under Test
ECG	Electrocardiography
FFT	Fast Fourier Transform
HFD	High Frequency Detection
IRG – OECD	International Research Group on Wear of Engineering Material under the sponsorship of Organization for Economic Co-operation and Development
KOH	Potassium Hydroxide
MCD	Magnetic Chip Detector
MI	Intermediate upkeep
MO	Normal upkeep
MR	Reconditioning and upkeep
OECD	Organization for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
RCM	Reliability-Centered Maintenance
RMS	Root Mean Square of a velocity
RPM	Revolution Per Minutes
SEE	Spectral Emitted Energy
TAN	Total Acid Number
TBN	Total Base Number
TPM	Total Productive Maintenance

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