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**APPLICATION OF PREDICTIVE MAINTENANCE TO
INDUSTRY INCLUDING CEPSTRUM ANALYSIS OF A
GEARBOX**

BY

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SUMMARY

The economic implications of equipment failure are called for effective maintenance techniques. The research investigates current maintenance practice in several New Zealand industries and the improvements that could be obtained by the use of predictive maintenance techniques.

Initial research was undertaken in a series of case studies within New Zealand industries situated in Auckland. The first two cases studies were of preventative maintenance techniques of two conveyor lines in a biscuit manufacturing company. The results showed a well defined preventive maintenance schedules that was Systems Applications Products (SAP) programme was used to managed for daily, weekly, monthly and yearly maintenance activities.

A third case study investigated current predictive maintenance technique involving Fast Fourier Transform analysis of shaft vibration to identify a bearing defect. The results diagnosed a machine with a ball bearing defect and recommendation was given to change the bearing immediately and install new one. The machine was opened up, a big dent was on one of the balls as predicted by the analysis and the bearing was changed.

Research then looked at a novel technique called Cepstrum analysis that allows the deconvolution of vibration spectra from separate sources. This allows identification of several defects from the monitoring of a single vibration signal. Experiments were carried out to generate transfer functions for different gear faults at two different loadings. Blind deconvolution of the signal using a homomorphic filter was used to separate the source forcing frequencies from the structure resonance effects of the two gear faults, indicating that the technique could be used successfully to monitor equipment for a range of gear faults occurring simultaneously.

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DECLARATION OF ORIGINALITY

I, Matthew Aladesaye, declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institute of tertiary education. Information derived from the published and unpublished work of others has been acknowledged in the text and a list of references is given in this thesis.

I also acknowledge that I have pursued the PhD course in accordance with the requirements of the university's regulations:

- Research practice and ethical policies have been complied with appropriately
- This thesis does not exceed 100,000 words, excluding appendices.

Signed.....

A handwritten signature in blue ink, appearing to be 'Matthew Aladesaye', written over a dotted line.