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Prediction of Wear Trend of Engines via On-line Wear Debris Monitoring

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Abstract

On-line wear debris monitoring is a useful technology for real-time machine wear condition monitoring but needs further development. This study, based on previous developments of an on-line visual ferrograph (OLVF), focused on (i) data reconstruction for extracting representative and reliable wear condition related characteristics, and (ii) development of an improved model for on-line wear prediction. Wear monitoring of a diesel engine was performed using this on-line wear debris monitoring system. Experimental results and comparisons between the improved relevance vector machine (RVM) model and other models show that the improved RVM model gives an earlier warning and enhances the prediction accuracy.

Keywords: Wear debris, Oil condition monitoring, Ferrography, Improved relevance vector machine

1. Introduction

Wear of moving components in machinery generates wear debris in the lube-oil which carries the information about the machine conditions as well as wear sources, rates and mechanisms. The on-line oil monitoring technology can be used for real-time condition monitoring by examining changes in the debris concentration and/or size. It can also be used to recognize the wear states of oil lubricated components when the machine is in operation [1–4].

The on-line visual ferrograph (OLVF) developed in Xi'an Jiaotong University has the advantages of high sampling frequency and automatic monitoring [5]. Wear particle

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