

OUTLIER JUDGEMENT AND DETERIORATION PREDICTION OF ROTATING EQUIPMENT BASED ON VIBRATION MEASUREMENT

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Received February 2007; received July 2007

ABSTRACT. *In this paper, a deterioration prediction method is proposed for maintenance of rotating equipment. Status of the rotating equipment is inspected by vibration measurement. A mathematical model for the deterioration of the equipment is derived in order to predict future condition of the rotating equipment. Potential defects of the rotating equipment can also be predicted by using this method. For the construction of the mathematical model, outliers such as measurement errors are eliminated in order to improve the accuracy of the model. The effectiveness of the proposed deterioration prediction method is assured by actual data of rotating equipment in thermal power plants.*

Keywords: Rotating equipment, Maintenance, Deterioration prediction, Outlier

1. Introduction. Rotating equipment in thermal power plants such as motors, pumps and fans are inspected both while in operation (on-stream inspection) and off-line periodic decomposition maintenance in order to retain functionality of the equipment. Currently, the maintenance is carried out by time-based maintenance according to the past records. Faults of the rotating equipment such as imbalance, misalignment, bearing faults and lubrication faults generate vibration signatures. In on-stream inspection, the status of rotating equipment is commonly monitored by systems that record vibration levels [1]. By monitoring the vibration of the rotating equipment, more appropriate condition-based maintenance [2] instead of the time-based maintenance can be achieved and hence the life cycle cost of thermal power plants including maintenance, repair and replacement costs will be reduced. The authors have previously proposed an optimal maintenance scheduling method for the equipment in thermal power plants using condition-based maintenance [3].

The outliers are removed from the real vibration data of the rotating equipment. These outliers disturb the extraction of deterioration tendency of the rotating equipment. Moreover, the outliers in the vibration data effect the deterioration prediction of the rotating equipment, significantly, and it causes frequent repairs and replacements. In practice, the outliers in the vibration data is not obviously defined, and the outliers are judged by the experts who inspect the rotating equipment.

Outlier consideration in estimation problems is one of the attractive fields in statistics and many techniques have been proposed, i.e., robust estimation in the normal mixture