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ON-LINE RESIDUAL LIFE ESTIMATION FOR CONDITION BASED MAINTENANCE OF ROTATING EQUIPMENT

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Abstract. *In this paper, an on-line residual life estimation method is proposed for maintenance of rotating equipment in industry plants. Condition of rotating machines is inspected by vibration measurement and a mathematical model for the deterioration of the equipment is derived in order to predict future condition of the rotating machines. For construction of the deterioration model, outliers in the vibration data such as measurement errors are eliminated in order to improve accuracy of the deterioration model. Residual life of the rotating machines is estimated by the deterioration prediction using the deterioration model in on-line fashion. The effectiveness of the proposed residual life estimation method is assured by simulation study and actual data of rotating machines in a thermal power plant.*
Keywords: Rotating equipment, Vibration data, Outlier judgement, On-line deterioration prediction, On-line residual life estimation

1. **Introduction.** Maintenance is very important for maintaining condition of equipment in industry plants. The growing cost of maintenance is a serious problem in industry and maintenance cost reduction is eagerly desired while preserving appropriate level of the system reliability. Time based maintenance (TBM) is effective when the chance of failures depends on the age of the equipment, i.e., the failure rate of the equipment increases with time. If the relationship between the failure and the equipment age is not high, TBM is ineffective strategy for reduction of life cycle cost of plants. In order to reduce the life cycle cost of plants, condition based maintenance (CBM) has been introduced in industry. In CBM, the condition of equipment in plants is monitored and the timing of the maintenance action is decided based on the condition of equipment [1]. In order to realize CBM, fault diagnosis is a key technique and a lot of fault detection methods are investigated [2-4].

Rotating equipment in industry plants is usually inspected in operation (on-stream inspection). Faults of the rotating machines such as imbalance, misalignment, bearing faults and lubrication faults generate unusual vibration signatures. In on-stream inspection, the condition of rotating equipment is commonly monitored with measuring vibration levels [5]. A lot of researches concerning CBM for rotating equipment have been carried out [6] such as the on-line fault identification and classification of rolling element bearing based on time-varying autoregressive spectrum [7], the residual life predictions of ball bearings based on self-organizing map and back propagation neural network methods [8],