Bayesian inferences of damage index and damage growth model based on on-site measurement data of steam turbine

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ABSTRACT

Accurate prediction of remaining useful life (RUL) of plant turbine is a major scientific challenge for effective operation and maintenance in the power plant industry. This paper proposes an RUL prediction methodology that incorporates a damage index into the damage growth model. Bayesian inference technique is used to estimate the probability distribution of a damage index from on-site hardness measurements with uncertainties. A Bayesian approach to the damage growth model is proposed for aged steam turbines and the predictive distribution of the damage index is estimated using its mean and standard deviation. As a case study, real steam turbines in power plants were used to demonstrate the effectiveness of the proposed Bayesian approach. The results from the proposed damage growth model can be used to predict the RULs of the steam turbines of power plants regardless of load types (peak-load or base-load) of the power plant.