Accuracy and Robustness of Decision Making Techniques in Condition Based Maintenance[1]

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Abstract

This paper presents a study on the accuracy and robustness of three well known decision-making techniques in condition based maintenance: Process Control Charts (SPC), the Hidden Markov Model (HMM), and the Proportional Hazards Model (PHM). Accuracy is the ability of each technique to lead to the correct decision. It is measured by type I and type II errors, and the proportion of correct decisions. Robustness is measured by the effects of variations in the models' parameters on its accuracy. A Monte Carlo simulation technique is used to simulate the decision making process when each of the three decision making techniques is used, and while perturbing the parameters. The effects are obtained by using Taguchi's design of experiments and the ANOVA technique. The results show that accuracy and robustness should be taken into consideration when a decision is made. Optimization techniques can be used to optimize the values of the parameters in order to minimize erroneous decisions and maximize the possibility of a correct decision.

Key words: Reliability and maintenance engineering, decision analysis and methods.

[1] This paper was not presented at any other revue. Corresponding author S Yacout. Tel. 514-340-4471 poste 4517. Fax 514-340-4463

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