Degradation Model Constructed with the Aid of Dynamic Bayesian Networks

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Abstract: This paper develops a generic degradation model based on Dynamic Bayesian Networks (DBN) which predicts the condition of a technical system. Besides handling bi-directional reasoning, a major benefit of modeling this degradation model by means of a Dynamic Bayesian Network is its capability to adequately model stochastic processes as well as Markov chains. We will assume that the behavior of the degradation can be represented as a P-F-curve (also called degradation or life curve). The model developed here is able to combine information from condition monitoring systems, expert knowledge and statistical uncertainties. Furthermore it can include any kind of observations like sensor data or notifications by the machine operator. Thus it is possible to even take the environment and stress into account under which the component or system is operating. That's why it is possible to detect potential failures at an early stage and initiate appropriate remedy and repair strategies.

Keywords: Degradation, Dynamic Bayesian Networks, P-F-curve, Stochastic Process