ASSET MANAGEMENT OF AGING DEVICES IN ENERGY SYSTEMS BASED ON PROBABILISTIC MODELLING: A CASE STUDY ON DIESEL ENGINES

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Declaration

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Abstract

The purpose of maintenance is to lengthen the equipment lifetime. Too little maintenance may have costly consequences; whereas too frequent maintenance may not be economical. Hence the two costs, i.e. the cost of failures and the cost of maintenance must be balanced. In practice, the attempts to approximate this balance have often been based on trial and error.

Here, a probabilistic maintenance model is developed for inspection based preventive maintenance of diesel engines based on the practical model concepts discussed in the literature. Developed model is solved using real data obtained from inspection and maintenance histories of diesel engines and experts' views. Reliability indices and costs were calculated for the present maintenance policy of diesel engines. A sensitivity analysis is conducted to observe the effect of inspection based preventive maintenance on the life cycle cost of diesel engines.

Optimal rates are obtained for inspection based preventive maintenance of diesel engines using the developed model and a grid search algorithm. The reliability and cost measures of the present maintenance practice and the optimal maintenance practice are compared. It is found that the current maintenance practice maintains the reliability and the life cycle cost of diesel engines at an acceptable level. However, the optimal policy suggested by the model is capable of further reducing the lifecycle cost and increasing the reliability.

Further, a state prediction tool is developed to validate the model. The same can be used to predict the deterioration condition of the diesel engine. A software tool is also developed with GUI interface for calculating purposes and presenting results.

Index Terms-- Maintenance, Diesel engines, Markov models, asset management.

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LIST OF ABBREVIATIONS

CBM	- Condition Based Monitoring
CM	- Condition Monitoring
RUL	- Remaining Useful Lifetime
md	- Minor Deterioration
MD	- Major Deterioration
FPT	- Failure Passage Time
MTTF	- Mean Time to Failure
MTBF	- Mean Time between Failures
LCC	- Life Cycle Cost
U	- Unavailability