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Minimizing Unscheduled Maintenance from an Aircraft and Rolling Stock Maintenance Perspective: Preventive Maintenance Model

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Abstract : The Corrective maintenance of components and systems is a problem plaguing almost every industry in the world today. Train operators' and the maintenance repair and overhaul subsidiary of the Dutch railway company is also facing this problem. A considerable portion of the maintenance activities carried out by the company are unscheduled. This, in turn, severely stresses and stretches the workforce and resources available. One possible solution is to have a robust preventive maintenance plan. The other possible solution is to plan maintenance based on real-time data obtained from sensor-based 'Health and Usage Monitoring Systems.' The former has been investigated in this paper. The preventive maintenance model developed for train operator will subsequently be extended, to tackle the unscheduled maintenance problem also affecting the aerospace industry. The extension of the model to the aerospace sector will be dealt with in the second part of the research, and it would, in turn, validate the soundness of the model developed. Thus, there are distinct areas that will be addressed in this paper, including the mathematical modelling of preventive maintenance and optimization based on cost and system availability. The results of this research will help an organization to choose the right maintenance strategy, allowing it to save considerable sums of money as opposed to overspending under the guise of maintaining high asset availability. The concept of delay time modelling was used to address the practical problem of unscheduled maintenance in this paper. The delay time modelling can be used to help with support planning for a given asset. The model was run using MATLAB, and the results are shown that the ideal inspection intervals computed using the extended from a minimal cost perspective were 29 days, and from a minimum downtime, perspective was 14 days. Risk matrix integration was constructed to represent the risk in terms of the probability of a fault leading to breakdown maintenance and its consequences in terms of maintenance cost. Thus, the choice of an optimal inspection interval of 29 days, resulted in a cost of approximately 50 Euros and the corresponding value of b(T) was 0.011. These values ensure that the risk associated with component X being maintained at an inspection interval of 29 days is more than acceptable. Thus, a switch in maintenance frequency from 90 days to 29 days would be optimal from the point of view of cost, downtime and risk.

Keywords : delay time modelling, unscheduled maintenance, reliability, maintainability, availability
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