

Failure risk indicators for a maintenance model based on observable life of industrial components with an application to wind turbines

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Abstract— This paper presents a new method able to estimate the health condition of components in a wind turbine based on the on-line information collected about their observable lives. The proposed method uses the information coming in real-time to characterize risk indicators for failure modes of the main components of a wind turbine operating under different normal conditions. The estimation of these risk indicators is based on normal behaviour models previously fitted with real data about the typical life of a component carrying out its functions within its own environment. The maintenance plan applied to the components of a wind turbine can be dynamically rescheduled according to the observed values of the risk indicators in a component using the resources that are really needed. Two approaches are presented to determine thresholds for alerting about risky health conditions: a maximum limit that the risk indicator should not overpass according to its life condition, and technical and economical feasibility. These approaches are the main foundations for a new maintenance model able to integrate in a natural way different information coming from the operation and maintenance of a component, and so capable of maximising the lifespan of the asset. Some real examples of the application of these new concepts in components of a wind turbine will be described.

Index Terms— Anomaly detection, component life monitoring, diagnosis, failure mode risk indicator, maintenance, normal behaviour models, wind turbine.

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Citation:

Andrade Vieira, R.J.; Sanz-Bobi, M.A.; "Failure risk indicators for a maintenance model based on observable life of industrial components with an application to wind turbines", IEEE Transactions on Reliability, vol.62, no.3, pp.569-582. September, 2013.