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Integration of Structural Health and Condition Monitoring into the Life-Cycle Management of Wind Turbines

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Cost-efficient operation and maintenance of wind turbines is among the major concerns for manufacturers, owners, and operators. Integrating structural health monitoring (SHM) into life-cycle management strategies can facilitate a cost-efficient and reliable operation of wind turbines. Furthermore, a precise scheduling of maintenance and repair work at minimum associated life-cycle costs is enabled. Using continuously updated monitoring data allows capturing the actual wind turbine condition and reducing uncertainty in resistance parameters and load effects acting on the structure. This paper presents a master plan for a life-cycle management (LCM) framework supporting online monitoring, reliability assessment as well as optimum maintenance and inspection planning of wind turbines. Installed on a 500 kW wind turbine in Germany, the LCM framework is exemplarily deployed for integrated life-cycle management using continuously updated structural, environmental, and operational wind turbine data. To validate the LCM framework and to demonstrate its practicability, a case study is presented investigating the operational efficiency of the monitored wind turbine over a two-year period.

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Ключевые слова:

Содержание

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- Wind Turbine SHM system
- Integrated LCM framework for Wind Turbines
- Conclusions
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