APCOM & ISCM
11-14th December, 2013, Singapore

A Time-Dependent Resilient-driven System Design Framework

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As engineered systems become large and complex with harsher operating condition, system reliability is of greater importance than ever. Currently, two engineering disciplines are used to satisfy the required system reliability: reliability-based design optimization (RBDO) and prognostics and health management (PHM). RBDO assures high system reliability in a system development stage while PHM enables proactive maintenance decisions, giving adaptive reliability. Although both disciplines are dedicated to make system reliable, their standalone exploit could yield redundant system design with high life-cycle cost (LCC). Recently the resilient-driven system design (RDSD) framework has been developed. It makes system resilient while minimizing LCC by cohesively incorporating RBDO and PHM. This paper aims at proposing a time-dependent RDSD framework which can rigorously assure the system reliability through its lifetime. The proposed framework is demonstrated with a wind turbine system design problem by using CAE tools from national wind technology center (NWTC) and Sandia National Laboratories.

Keywords: Resilience, Reliability-based design optimization (RBDO), Prognostics and health management (PHM), Wind turbine