



Contribution ID: 17

Type: **not specified**

A condition-based maintenance policy in a system with heterogeneities

Thursday, 19 May 2022 14:20 (20 minutes)

Models that describe the deterioration processes of the components are key to determining the lifetime of a system and play a fundamental role in predicting the system reliability and planning the system maintenance. In most systems there is heterogeneity among the degradation paths of the units. This variability is usually introduced in the model through random effects, that is, considering random coefficients on the model. A degrading system subject to multiple degradation processes whose initiation times follow a shot-Cox noise process is studied. The growth of these processes is modeled by a homogeneous gamma process. A condition based maintenance policy with periodic inspections is applied to reduce the impact of failures and optimise the total expected maintenance cost. The heterogeneities between components are included in the model considering that the scale parameter of the gamma process follows a uniform distribution. Numerical examples of this maintenance policy are given comparing both models, with and without heterogeneities.

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Session Classification: Maintenance optimization