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Risk assessment methodologies in maintenance decision making: A review of dependability modelling approaches

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ABSTRACT

The risk assessment process performs an important role in maintenance decision making, through structuring the process of identifying, prioritizing, and thereafter formulating effective maintenance strategies. However, the effectiveness of the implemented strategies is influenced by the extent to which asset failure dependencies are taken into account during the risk assessment process. In the literature, several risk assessment methods are discussed that vary widely depending on factors such as modelling of failure dependencies in dynamic assets, and treating uncertainties associated with sparse reliability data. These factors invariably influence the extent to which different risk assessment methods are applicable for maintenance decision making. This article reviews the state-of-the-art knowledge on risk assessment in the context of maintenance decision making, with a particular focus on dependability modelling methods. The review structures knowledge on dependability modelling approaches, treatment of uncertainty, and highlights important challenges researchers and practitioners are likely to experience when performing risk assessment in the context of maintenance decision making. The challenges highlighted include the resolution complexity of methods such as Bayesian networks, especially while assessing risks of assets with complex failure dependencies.