Review of: "An Approach to Robust Fatigue Life Prediction to Be Used in Early Design Stages"

Hassan Gonabadi

Potential competing interests: No potential competing interests to declare.

This work proposes a new tool that integrates solid mechanics and quality management to streamline the fatigue-resistant design process, providing quick and accurate computational estimates for robust engineering solutions, with preliminary results demonstrated on an airplane wheel axle. The manuscript is well structured and worth publishing in the journal; however, some points need to be clarified as detailed below before official publication:

1. While the introduction section provides valuable insights and proposes a solution, there are several technical points that need to be considered:

Lack of Specificity: The introduction section mentions the need for a tool to integrate fatigue analysis early in the design process but lacks specific details about the proposed tool's technical aspects. Readers may find it challenging to understand how the tool operates and its technical capabilities.

Limited Technical Description: While the introduction section discusses the purpose of the proposed tool and the techniques used, it lacks in-depth technical descriptions of the methodologies employed.

Limited Discussion on Implementation Challenges: The introduction section briefly mentions using Excel, Minitab, and Ansys for tool development but does not discuss potential challenges or limitations associated with integrating these tools for fatigue analysis in early design stages. Addressing implementation challenges would provide readers with a more realistic understanding of the tool's applicability.

I would suggest using more literature review in the introduction section; the below papers are good examples that authors can cite:

- Fatigue Life Prediction of Composite Tidal Turbine Blades, Journal of Ocean Engineering", 2022,https://doi.org/10.1016/j.oceaneng.2022.111903
- Investigation of the Effects of Environmental Fatigue on the Mechanical Properties of GFRP Composite Constituents Using Nanoindentation", Journal of Experimental Mechanics", 2022.https://doi.org/10.1007/s11340-021-00808-4

2. The methodology section provides an overview of two methodologies used in the proposed tool: fatigue analysis and robust design methodology. However, there are some technical points that need to be addressed as below:

2.1. Lack of Clarity in the Integration Process: While the methodology section mentions combining methodologies from Solid Mechanics and Quality Management, it lacks clear elucidation on how exactly these methodologies are integrated

into the proposed tool.

2.2. Inadequate Explanation of Robust Design Methodology: Although it introduces Robust Design Methodology (RDM), it provides a somewhat convoluted explanation of its principles and application. A clearer, more concise description would improve comprehension, especially for readers unfamiliar with RDM.

2.3. Simplistic Treatment of Design of Experiments (DoE): The text briefly mentions the use of Design of Experiments (DoE) for detecting factors influencing product performance, but it lacks depth in explaining the intricacies of DoE methodology. Providing more detailed examples or references would assist readers in understanding its application in the proposed tool.

2.4. Lack of Discussion on Limitations: The text does not address potential limitations or challenges associated with applying the described methodologies in practical engineering scenarios. Acknowledging and discussing these limitations would provide a more balanced view of the proposed approach.

3. The conclusion section needs a clearer structure: The conclusion section could benefit from a clearer structure, such as separating sections for tool development, validation, comparison to traditional methods, and discussion of findings. This would improve readability and help readers navigate through the information more easily.