



FABER

Executive Summary

State of the art

Metal fatigue is a major concern in engineering as it weakens metal components over time. It occurs due to repeated stresses, even if those stresses are below the metal's apparent breaking point. Predicting fatigue is difficult and such process relies on complex calculations or expensive testing. Engineers use computer models to assess fatigue risk in designs, but these models may not be entirely accurate. There's a push for better methods to estimate fatigue so that safer and cheaper designs can be made.

Fatigue solvers are software tools built to reduce design costs and time. However, the core methods used in these solvers have not significantly improved in decades, hindered by the prioritization of speed and marketability over accuracy. Developers tend to downplay the need for fatigue expertise and avoid independent evaluation of their software's effectiveness by a limiting end user license agreement. This lack of focus on improvement may well hinder advancements in fatigue estimation.

The question is, how can a user test the correctness of a fatigue solver? The FABER project proposes the creation of robust benchmarks for fatigue data to enable better fatigue estimation methods and ultimately lead to safer and more cost-effective designs.

COST

This leaflet is related to the future COST Action “Fatigue Benchmark Repository”, which is negotiated to be supported by COST (European Cooperation in Science and Technology) from November 2024 for 4 years. COST is funding agency for research and innovation networks. Its Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research career and innovation.

Stakeholders

FABER concerns a challenge in the engineering field related to fatigue analysis of materials. There are three main stakeholders involved:

- **Academia** - Universities are supposed to research and improve methods for predicting fatigue damage in metals. However, funding cuts and a focus on new research areas have reduced efforts in verifying existing methods used in fatigue solver software.
- **Industry** - Companies rely on accurate fatigue analysis to ensure the safety and lifespan of their products. They use fatigue solver software for efficiency, but there is a concern about the software's accuracy.
- **Fatigue Solver Developers** - These companies create the software tools for fatigue analysis. They are motivated by profit and may not prioritize improvements to the core methods used in their software.

There is a lack of robust and affordable ways to verify the accuracy of fatigue solver software. This is leading to a situation where none of the stakeholders are taking full responsibility for ensuring the reliability of fatigue analysis methods.

Objectives

The overall goal of this project is to improve fatigue analysis methods by creating a central resource for data and tools. This will be achieved through several objectives:

- **Building a large, reliable database of experimental fatigue data:** This data will be collected, curated, and made accessible to researchers.
- **Developing open-source software tools:** These tools will allow researchers to easily use the fatigue data for benchmarking fatigue estimation models.
- **Encouraging collaboration between researchers and industry:** This will involve creating joint research groups, organizing challenges, and promoting the use of standardized practices.
- **Improving the quality of fatigue solver software:** By providing better benchmark data and encouraging collaboration, the project aims to make fatigue solver software more accurate and reliable.
- **Standardizing data management practices:** This will ensure that all data is collected, stored, and analyzed consistently.
- **Building a long-term sustainable effort:** The project aims to establish a system that can continue to grow and improve after the initial funding period ends.

Overall, the project aims to create a more efficient and reliable fatigue analysis process by establishing a central resource for data and tools, fostering collaboration between stakeholders, and promoting the use of standardized practices.

If you wish to join us or to study the full **Memorandum of Understanding**, you can access it here: <https://www.cost.eu/actions/CA23109/>

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