

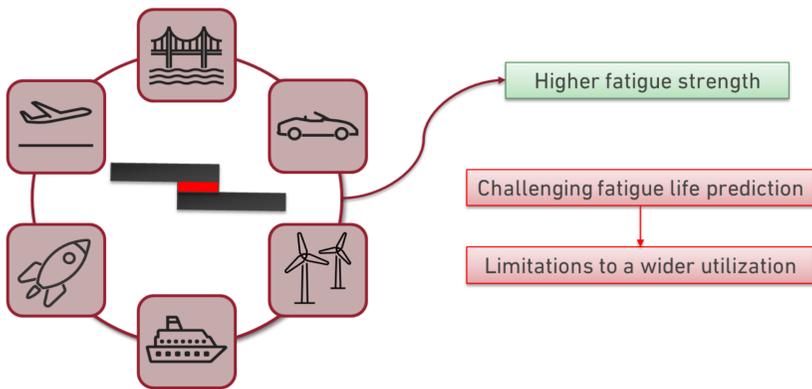
# A practical tool for industry: Tackling the persistent challenge of fatigue life prediction in real-world adhesive joints

A Akhavan-Safar (INEGI, Portugal) | RJC Carbas | EAS Marques | Lucas F.M. da Silva

## 1. Introduction

The use of adhesive joints in various industrial sectors is due to their greater fatigue resistance, but fatigue failure prediction in adhesive joints remains a critical challenge in industries such as automotive, aerospace, energy, and heavy machinery. Reliable fatigue life prediction is complicated by the strong dependence of joint behavior on multiple interacting factors:

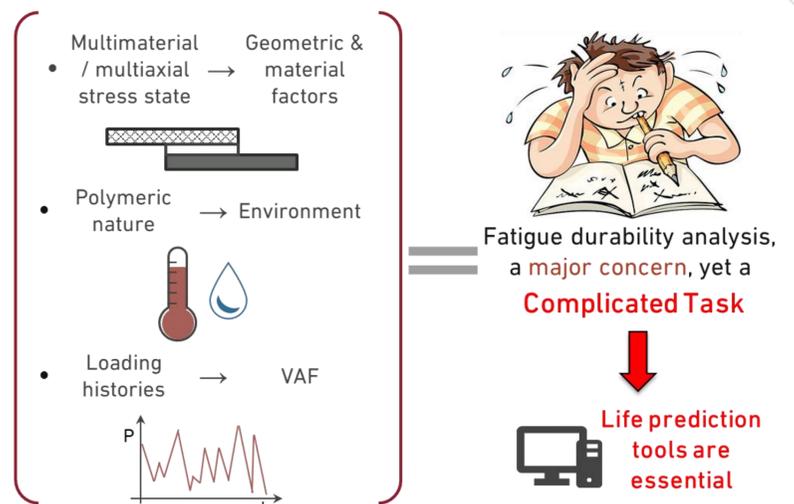
- Adhesive type
- Joint geometry
- Environmental conditions
- Loading mode



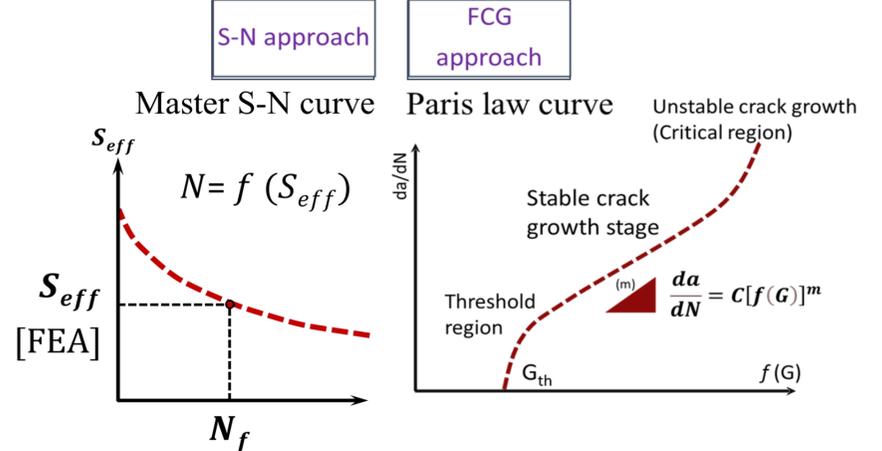
While S-N curve methods are commonly used in industry, their accuracy is highly sensitive to these parameters. Fatigue crack growth analysis provides additional insight but increases modeling and testing complexity.

To address these industry-driven challenges, a novel fatigue life prediction tool is being developed. This tool is designed to integrate material, geometry, and environmental factors, enabling more reliable and practical evaluation of bonded joints in complex structural assemblies.

## 4. Novel fatigue life prediction tools



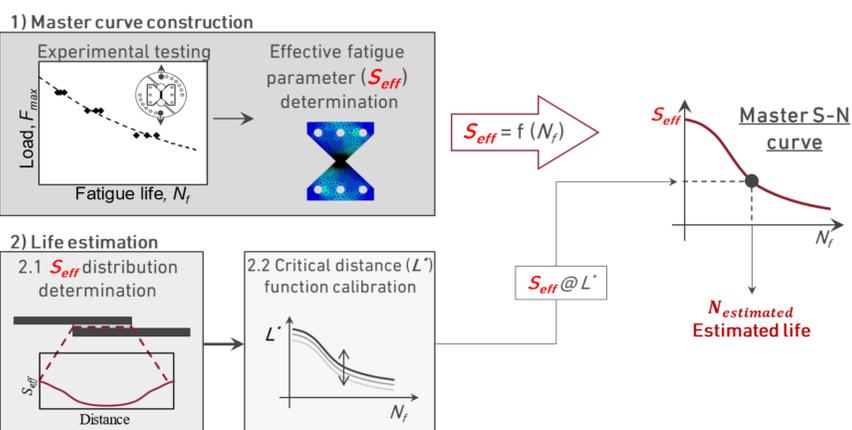
### BondLife and BondCrack



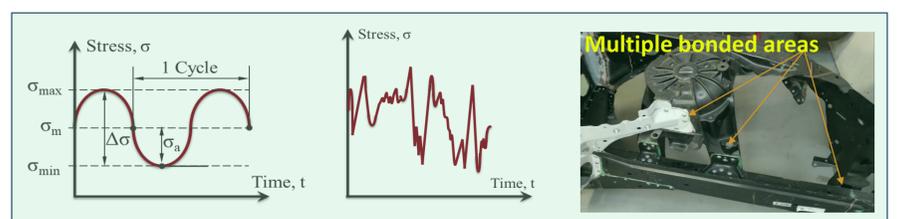
**BondLife**  
An Innovative Software Dedicated to the S-N Fatigue Life Prediction of Adhesively Bonded Joints

**BondCrack**  
A Numerical Tool for Fatigue Crack Growth (FCG) Analysis of Adhesively Bonded Joints Using Cohesive Zone Modelling

## 2. Methodology



## 5. Some features



## 6. Conclusions

Adhesive bonding faces durability challenges, particularly in fatigue life prediction. To address this, two novel tools—**BondLife** for S-N fatigue analysis and **BondCrack** for fatigue crack growth via cohesive zone modelling—are being developed collaboratively.