Integrated fatigue design methodology for defective materials

Yves Nadot, Carole Nadot-Martin

Modelisation of defect type, size, position, morphology and loading in a fatigue criterion
Calculation of the allowable fatigue defect size on an industrial component
Link between industrial NDT and fatigue defect (via μtomography analysis)
Towards a unified fatigue criterion for treating micro-notch fatigue and fretting-fatigue

Highlights

Experimental identification of the predominant role of defect morphology in cast AlSi components
Beneficial role of the inert environment for internal defects, which explains the difference between surface and internal defects
Manufacturing of a fatigue sample with micro notch to represent the gradient encountered in fretting-fatigue
Demonstration of the effectiveness of a probabilistic approach to describe fatigue on micro-notch (Titanium) and defect (Fonte GS)
Implementation and experimental validation of an industrial component fatigue calculation method taking into account type, size, position, morphology and loading using the DSG (Defect Stress Gradient) criterion based on the Eshelby inclusion theory
Experimental validation on components

DSG criterion: Application to Additive Manufacturing

Internal defect

Local morphology

Simulation / experiment on real components

3 PhD, 2 masters, 1 ANR / Academic collaboration: LMT, CTIF, MATEIS, Université de Budapest, Université de Brasilia, Université de Sydney / Industrial collaboration: Safran Tech, Safran TS, Safran AE, Safran Seats, Knorr Bremse, AIRBUS, Fonderie Messier