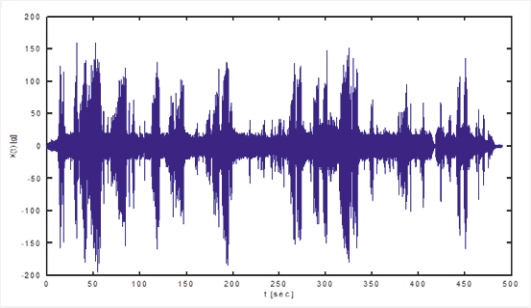
Intelligent Testing

FatiResponse

Damage-Equivalent Vibration Testing

iABG

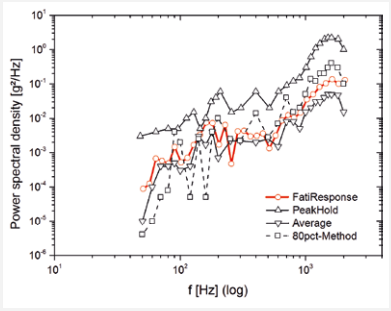


FatiResponse

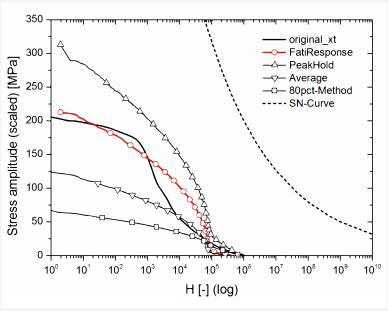
FATIRESPONSE SPECTRUM

FATIGUE EQUIVALENT TESTING MODULE

TEST PSDS



COLLECTIVE AMPLITUDE



FatiResponse • Damage-Equivalent Vibration Testing

Challenges

The fatigue strength of components excited by inertial force under vibration-type loads is often verified by means of vibration tests with broad-band noise signals (power spectral density = PSD). Both OEMs and suppliers need to design and qualify components w loads equivalent to real-life operational loads. For this purpose, they require suitable PSD excitation spectra at an early stage in the design phase. The state of the art for generating the PSD using the fast Fourier transform algorithm with overlapping windows generally delivers spectra which, without further scaling, lead to significant overtesting or undertesting.

IABG FatiResponse Method

The FatiResponse method developed by IABG enables the analysis of operational vibration loads and the derivation of test settings to be used for the design and qualification of vibration-proof components. By means of a comprehensive dynamics and damage model, a PSD test spectrum is created which covers damages equivalent to those caused by the measured operational loads. All relevant operating states are analysed, delivering stress spectra in different application scenarios throughout the service life of a component. The method can take into account the dynamic system behaviour and any relevant failure mechanisms, e.g. fatigue or wear. The associated parameters can usually be derived from previously used components. The software calculates the desired test duration as well as the overtesting or undertesting to be expected based on the maximum load amplitudes.

Services

Acquisition and preparation of load data

- Installation of sensors and measuring equipment on test vehicles
- Execution of measurement campaigns to capture operational loads
- Processing and analysis of measurement results

Derivation of damage-equivalent test settings ("Test Tailoring")

- Description of load conditions via Fatigue Response Spectra (FRS)
- Combination of user profiles to create individual mission profiles
- Derivation of damage-equivalent test spectra and test time signals using the Fatigue Equivalent Testing module (FET)

Qualification

- Vibration tests with frequencies ranging up to 2500 Hz on electro-mechanical shakers or servo-hydraulic vibration test benches with test items weighing up to 10 t, optionally under different climate and environmental conditions
- FEM simulation and computational fatigue strength analyses

Development support

- Optimisation of components and systems exposed to vibration loads in terms of dynamic behaviour and service life
- Material and damage analyses to identify potential issues and optimise components

AUTOMOTIVE

INFOCOM

MOBILITY, ENERGY & ENVIRONMENT

AERONAUTICS

SPACE

DEFENCE & SECURITY

About IABG

IABG offers integrated, ground-breaking solutions in the sectors Automotive • InfoCom • Mobility, Energy & Environment • Aeronautics • Space • Defence & Security. We provide independent and competent consulting. We implement with future viability and target orientation. We operate reliably and sustainably. Our success is based on an understanding of market trends and requirements, on our staff's technological excellence and a fair relationship with our customers and business partners.

As a development partner we provide quality control services and develop solutions in the areas of functional efficiency, quality, design, and materials. We offer a broad spectrum of products and services, ranging from numerical analysis to experimental testing to the realisation of turnkey, customised test systems that we operate for the customer.

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