

NX Advanced Durability

Advanced predictions of product life and fatigue damage



fact sheet

Siemens PLM Software

www.siemens.com/nx

► Summary

NX™ Advanced Durability software helps to validate a product's structural integrity over its entire lifecycle under either simple or complex loading conditions. Expert analysts use this solution to perform in-depth fatigue analysis and life calculations to help them determine product durability based on NX Nastran, NX Response Simulation, MSC Nastran, Ansys and Abaqus solutions. NX Advanced Durability is provided as an add-on module to NX Advanced FEM or NX Advanced Simulation.

Benefits

Improves product design robustness by determining the life of product designs

Reduces physical testing costs by enabling you to analyze product life in a virtual environment

Accelerates product development by enabling you to quickly perform what-if "re-analysis" of new designs to understand the impact of design changes on product durability

Features

Analyzes fatigue damage due to single or multiple static and transient events.

Performs what-if scenarios by overriding FEM materials in the durability event or by using the NX simulation override capability

Analyzes the entire FE model or just the critical areas of your model

Leverages geometry associativity to quickly evaluate the impact of changing geometrical features on fatigue resistance

Supports stress (high cycle) and strain (low-cycles) approaches

Uses a wide range of fatigue algorithms considering both uni-axial and bi-axial loading

Displays fatigue life, damage and safety factors as contour plots

Includes NX Durability Wizard (in NX Advanced Durability)

An advanced toolset for determining product life and fatigue damage

NX Advanced Durability provides a set of analytical tools to predict the life of products and evaluate their fatigue resistance when they are subjected to prescribed stress and/or strain histories residing in NX structural solutions. Advanced Durability can estimate the damage incurred during single or multiple events.

Damage and life results are displayed as contour plots on your model for intuitive interpretation.

The durability meta-solution process can contain multiple static and transient events. An event is comprised of:

- An NX or imported stress analysis solution
- Durability solver settings
- Element and material selection

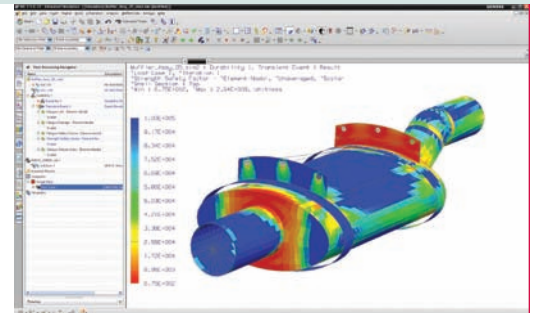
The durability solution process can calculate the strength and fatigue results for:

- Each event separately
- All the active events in the durability meta-solution process

There are two types of events.

Static events, which determine the strength safety factors, fatigue safety factors and fatigue life of your structural model with respect to a static solution on which pre-determined cyclical loading patterns are superimposed. A static event references stress and strain results from the following solutions:

- NX Nastran or MSC Nastran: SESTATIC 101 – single constraint and SESTATIC 101 – multi-constraint
- Ansys: Linear statics
- Abaqus: Static perturbation



Transient events, which determine the strength safety factors, fatigue safety factors and fatigue life of your structural model with respect to time-domain transient loading. A transient event references results from the following solutions:

- NX Nastran: SEDTRAN 109 and SEMTRAN 112
- NX response simulation (.rs2 files that contain geometry information)
- NX Nastran SEMODES 103: flexible body solution with the flexible body recovery option defined
- NX Nastran advanced nonlinear: ADVNL 601,129 and ADVNL 701 (linear stresses and strains)

Advanced Durability supports the following:

Life criteria

- Stress life
- Strain life
- Smith-Watson-Topper

Stress direction approaches

- Principal axes
- Maximum damage
- Maximum shear

Stress/strain states

- Uni-axial
- Bi-axial

Mean stress effects

- Goodman
- Morrow
- Soderberg
- Gerber

Notch effects

- Neubers method
- Fuchs method

Cyclic stress-strain relations

- Ramberg-Osgood
- Power hardening
- Linear

Rainflow cycle counting



► **Contact**
 Siemens PLM Software – www.siemens.com/nx
 Americas 800 498 5351
 Europe 44 (0) 1276 702000
 Asia-Pacific 852 2230 3333

SIEMENS