

ANSYS® nCode DesignLife™ Product Spec Sheet

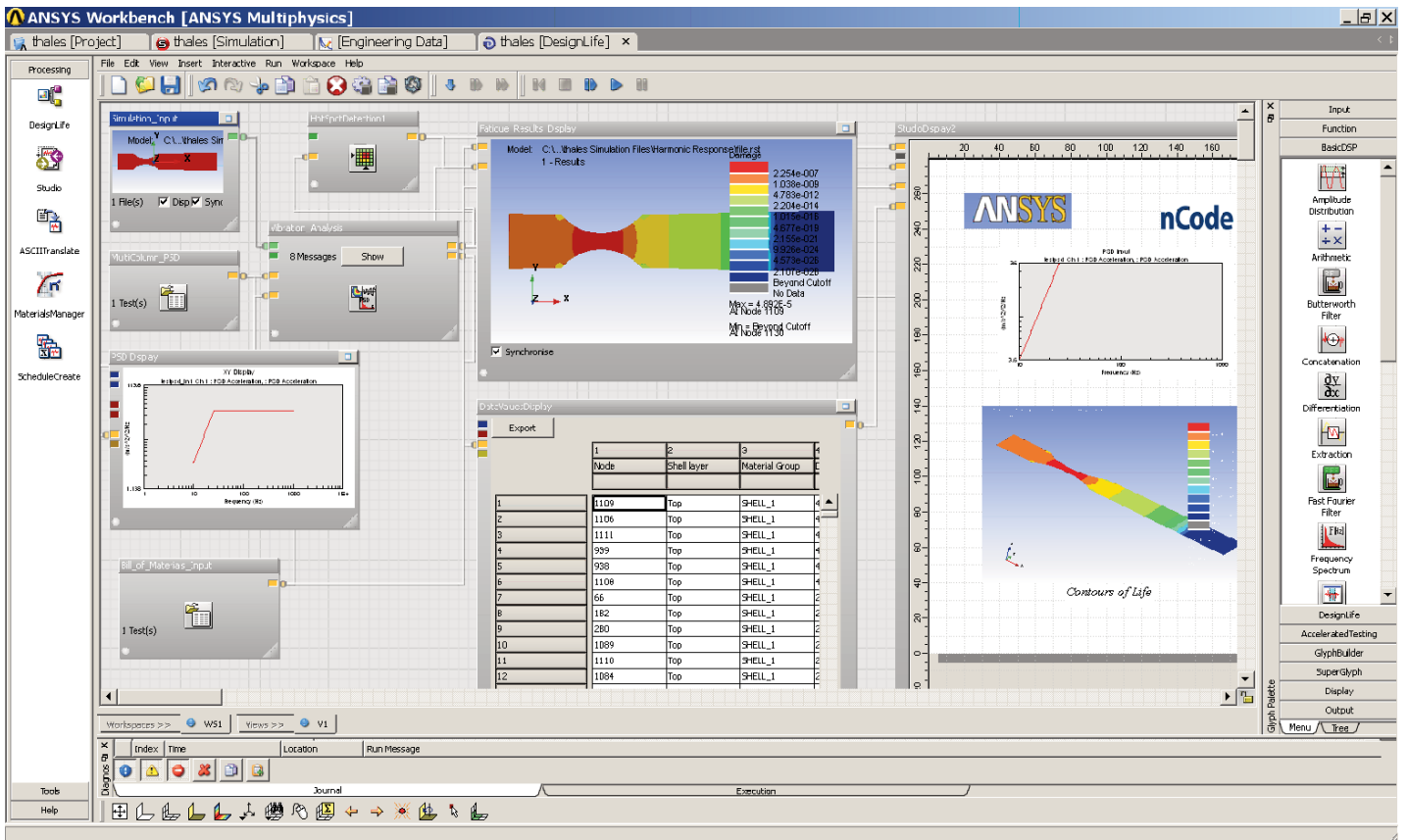
ANSYS nCode DesignLife provides advanced fatigue analysis integrated within the ANSYS Workbench I I SPI environment. Results and materials data from simulations within Workbench can be directly accessed by DesignLife. This provides an unparalleled combination of ease of use and powerful fatigue analysis for ANSYS users.

In addition to the general stress-life and strain-life approaches, DesignLife provides established methods for both spot and seam weld analysis and vibration shaker tests can be directly simulated in the frequency domain. ANSYS nCode DesignLife efficiently analyzes large finite element models and complete usage schedules. It is highly configurable for the expert user including support for Python scripting to enable new or proprietary fatigue methods.

One Environment

The ANSYS® Workbench™ environment provides a single setting for simulation from start to finish, enabling users to perform more product development tasks faster. ANSYS Workbench delivers the basis for a full computer-aided engineering (CAE) solution from ANSYS, providing access to a wide variety of simulation technologies.

All settings are persistent and are connected back to the parametric computer-aided design (CAD) model, from analysis-specific modifications made to the geometry through the application of physics, solver control parameters, graphic objects created during post-processing and quantitative expressions evaluating performance.



ANSYS nCode DesignLife is a powerful solution to predict fatigue life from virtual simulations, making it possible to:

- Perform virtual durability assessment up front to reduce reliance on physical test and avoid costly design and tooling changes.
- Perform smarter and quicker physical tests by simulating first.
- Design durability into your products and reduce warranty claims.
- Assess more design options, consider more realistic loading conditions and more confidently reduce cost and weight.
- Standardize analysis processes to improve consistency and quality.
- Seamless access to results and expanded material library from simulations within Workbench.

DesignLife Standard Package

Stress Life solver

Enables fatigue life calculations to be made using the stress-life approach. Includes the ability to interpolate between material curves depending on the temperature. Python scripting can also be used to add new or proprietary SN methods. Primary application is high-cycle fatigue (long lives) where nominal stress controls the fatigue life.

- Material models
 - Standard SN
 - SN Mean multi-curve
 - SN R-ratio multi-curve
 - SN Haigh multi-curve
 - SN Temperature multi-curve
 - Bastenaire SN
 - Custom SN using Python
- Mean stress corrections
 - FKM Guidelines
 - Goodman
 - Gerber
- Stress gradient corrections
 - FKM Guidelines
 - User defined
- Back calculations to target life

Strain Life solver

Enables fatigue life predictions to be made using the local strain approach. Includes the ability to interpolate between material curves depending on the temperature at each location. Applicable to a wide range of problems including low-cycle fatigue with the local elastic-plastic strain controls the fatigue life.

- FE results input
 - Stress
 - Linear strain
 - Stress & Strain
- Material models
 - Standard EN
 - EN Mean multi-curve
 - EN R-ratio multi-curve
 - EN Temperature multi-curve
- Mean stress corrections
 - Morrow
 - Smith Watson Topper
- Plasticity Corrections
 - Neuber
 - Hoffman-Seeeger
- Multiaxial Assessment
 - Biaxial
 - 3D Multiaxial
 - Auto-correction
- Back calculations to target life

Dang Van solver

Enables Dang Van safety factor calculations. The Dang Van criterion is a method of predicting the endurance limit under complex loading situations. The output from the analysis is always expressed as a safety factor not a fatigue life. Specific material parameters are calculated from tensile and torsion tests. It has primary application for engine and powertrain-type applications where there are very large numbers of loading cycles.

- Multiaxial calculations using the Dang Van approach
- Calculate safety factors, danger factors Tau_zero

ANSYS nCode DesignLife also provides:

- Selection of model subsets for analysis by property id, material group or user defined set
- Multiple analysis types within the same job
- Multi-stage analyses to focus in quickly on critical areas
- Identification of critical areas and hotspots automatically
- Robust multiaxial assessment methodology
- Looping on input data for multiple calculations
- Support for parallel processing (SMP)
- Interactive or batch mode processing
- Percent certainty of survival using material scatter data.

FE results import

- ANSYS® rst file
- Large file support
- Stresses from 2-D, 3-D solids, shell and membrane elements
- Element centroid, nodal averaged, nodal unaveraged stresses
- Load results from multiple FE results files in the same job
- Linear static, modal or transient/time-step or frequency response FE results
- Identify surface nodes and resolve stresses to surface plane for efficient multiaxial processing
- Determine surface normal stress gradients
- Steady state or time varying temperatures

Loading inputs

- Linear superposition, time step, constant amplitude, duty cycle, aero spectrum input, random (PSD) and swept sine loading inputs
- Hybrid load provider allows superposition of time series, transient and constant amplitude loads
- Loading inputs in all nCode supported formats
- Read a .laf (load association) file
- Read GlyphWorks schedule files
 - Use duty cycles for all analysis types:
 - Use different channels in different events
 - Mix different types of event within a duty cycle
 - Nesting of duty cycles
 - Loading sequence
- Duty cycle processing options:
 - Calculate event damage independently
 - Logically concatenate schedule
 - Fast approach including consideration of residuals
- Filter loading inputs for efficient processing
- Functions for import, display and manipulation of loading inputs

Results output

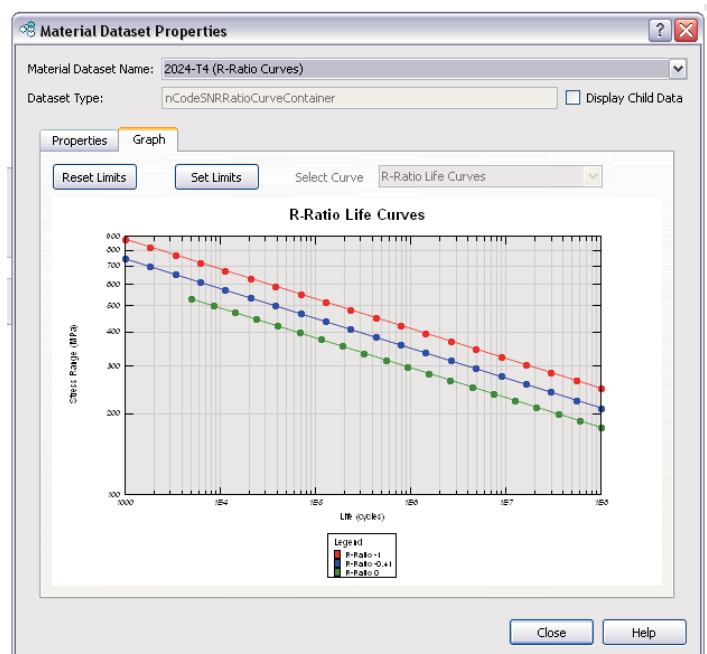
- Output results to pipe, FER and CSV
- Output time histories or PSDs from any location (e.g. from critical areas or gauge locations)
- Multiple sort and filter results for smarter post-processing (e.g. by part or panel ID)

Post-processing

- Post-process fatigue and stress analysis results in FE-Display
 - Make contour and marker plots
 - Quickly identify hotspots
 - Cursor pick results
- Tabulate, sort and manipulate results
- Produce report pages automatically using the Studio Glyph

Managing Materials

- Import material maps from file (e.g. a bill of materials) or from pipe - define complete material mapping for each group from an external .CSV or multi-column input pipe.
- Import part numbers and other information for improved post-processing
- Database of commonly used material properties with examples to support all analysis types
- Materials database manager – create, edit or import material data
- Tabulate and graphically display material curves
- Estimate fatigue properties from monotonic data
- Estimate effects of surface condition on fatigue performance
 - FKM guideline method used for roughness and treatment
 - Use descriptive or quantitative roughness value
 - User input correction factor
 - Method applicable to all S-N and E-N calcs



Core components and glyphs

DesignLife environment

Studio module for viewing data and creating report templates

Flowproc batch processing of flow processes.

DTProc batch processing of the nCodeDT fatigue engine.

ASCIITranslate module for converting ASCII data to binary time series and multi-column formats.

ScheduleCreate module for the creation of schedule files and CAE duty cycle files

MaterialsManager module for the management of material databases, including creating, editing and viewing material datasets

FE-Display for graphical display of FE models with stress analysis results contours within Studio and the FE input and display glyphs.

Add-on ANSYS nCode DesignLife Products

- ANSYS nCode DesignLife Welds
- ANSYS nCode DesignLife Vibration
- ANSYS nCode DesignLife Parallel
- ANSYS nCode DesignLife Accelerated Testing

ANSYS nCode DesignLife Welds

Enables spot-weld and seam weld fatigue life calculations. Several model methods are supported for each weld type Spot weld method based on LBF method (SAE 95071 I). Spot welds are modeled by stiff beam elements. Cross sectional forces and moments are used to calculate structural stress around the edge of the weld spot. Life calculations are made around spot weld using linear damage summation and reporting worst case. Seam weld method based on the “Volvo” approach (SAE 98231 I) and validated through years of use in industry projects. Support for fillet, overlap and laser welds with weld toe, root and throat failure analysis.

Spot Weld Analyzer

- Spot weld fatigue analysis using the Rupp/LBF approach
- Beam elements
- Optionally predicts torsional failure mode

Seam Weld Analyzer

- Seam weld analysis using “Volvo” method
- Applicable to fillet, overlap, and laser welds
- Thickness and mean stress correction
- Bending correction by interpolation
- Weld toe, root, and throat failures may be predicted
- User defined bending ratio threshold

ANSYS nCode DesignLife Vibration

Enables stress-life fatigue calculations based on FE-based Frequency Response Functions and PSD or swept-sine loading definitions, including a static offset load case. This provides an efficient way of analyzing fatigue problems in the frequency domain with particular application to simulating vibration shaker tests or loadings well described in the frequency domain such as wind or wave states.

ANSYS nCode DesignLife Parallel

DesignLife can parallel process on machines with multiple processors (SMP only). Each Parallel License allows another core to be utilized.

ANSYS nCode DesignLife Accelerated Testing

Accelerated Testing provides the ability to create a representative PSD or swept sine shaker vibration test based on measured data. It enables the combination of multiple time or frequency domain data sets into representative spectra that accelerates the test without exceeding realistic levels. This option creates the spectra which are used together with the Vibration Fatigue solver option to simulate vibration tests.

ANSYS nCode DesignLife Platform Support

- Windows (64-bit): Windows XP 64, Vista 64
- Windows (32-bit): Windows XP, Vista