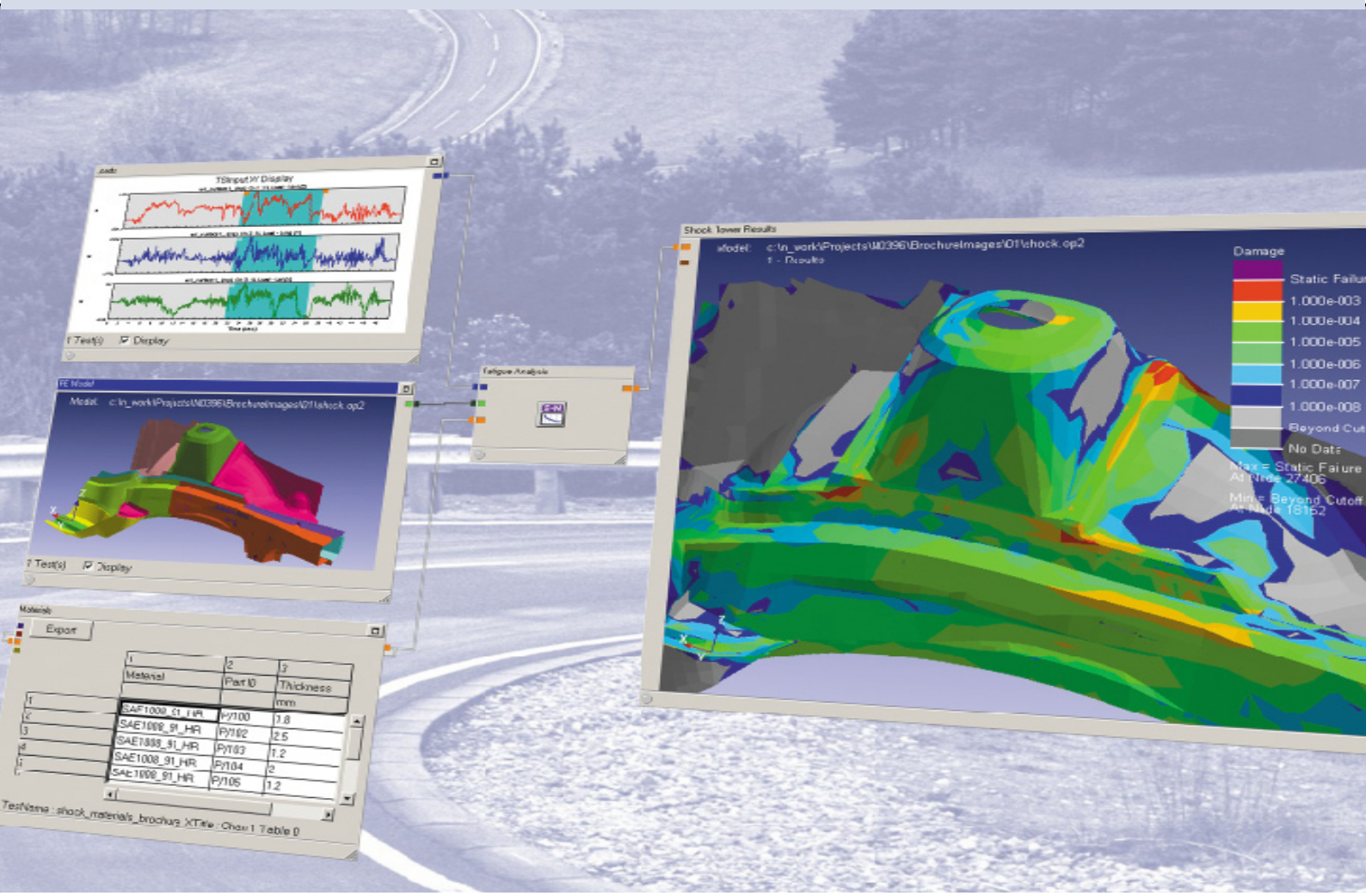
nCode

Eliminating the Unexpected

Specification Sheet

ICE-flow® DesignLife™



DesignLife is the next generation CAE fatigue analysis tool from nCode. It incorporates over 25 years of experience and feedback from leading users and our industry partners.

DesignLife works with all leading FE codes, identifies fatigue hotspots, and makes realistic estimates of fatigue life. Uniquely, DesignLife is based on an architecture that integrates advanced Test and CAE analysis tools within a simple-to-use graphical workflow environment.

It's powerful, it's quick, and it produces all the information you need to make upfront design decisions!

DesignLife Main Features

- Works with leading FE codes and postprocessors
- Linear, static, dynamic, and frequency-domain stresses
- Tools to manipulate measured / synthethized loads
- Materials properties: library, custom generated
- Stress-life and strain-life approaches
- Multiaxial assessment and analysis
- Analysis of seam and spot welds
- Calculates hotspot locations and fatigue-life
- Graphical interface for interactive process development
- Multi-threaded parallel processing
- Built-in automatic report generator
- Export to common post-processors

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ICE-flow DesignLife

FE results import
- NASTRAN op2, ANSYS rst, ABAQUS fil and odb files, LS-DYNA, and UNV file
- Large file support
- Stresses from a wide range of 2-D, 3-D solid, shell and membrane elements
- Element centroid, nodal averaged, nodal unaveraged stresses
- Spot welds using simple bar elements, with or without "spiders", CWELD or ACM2 (HEX + MPC) representations
- 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

Loading inputs
- Linear superposition, time step, constant amplitude, duty cycle, aero spectrum input, random (PSD) and swept sine loading inputs
- 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
- Toolkit (GlyphWorks) for import, display and manipulation of loading inputs

General processing
- Select model subsets for analysis by property id, material group or user defined set
- Perform multiple analysis types within the same job
- Perform multi-stage analyses (e.g. to refine analyses) – focus in quickly on critical areas
- Identify critical areas and hotspots automatically
- New robust multiaxial assessment methodology
- Exact cycle values are used
- Looping on input data
- Supports parallel processing (SMP)
- Process interactively or in batch mode
- Stress gradient sensitivity taken into account

Results output
- Output results to pipe, FER, CSV, or common postprocessor formats (e.g. .hyp, .bof, .odb, .unv, .fef, .ans)
- Output time histories or PSDs from any location (e.g. from critical areas or gauge locations)
- Multiple sort and filter results for smarter postprocessing (e.g. by part or panel ID)

Postprocessing
- 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
- Import part numbers and other information for improved postprocessing
- 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

S-N analyzer
- Supports the following S-N formulations
  - Standard log-log curves
  - Digitized S-N curves including nested multi-mean or R-ratio curves
  - Haigh diagrams
- Simple and critical plane methods
- Auto-mode available for multiaxial loadings
- Rainflow cycle counting and linear damage summation
- Static failure checking and statistics
- Mean stress correction by Goodman, Gerber or interpolation
- Back calculations on scale factor

E-N analyzer
- Local strain approach
- Neuber and Hoffmann-Seeger notch corrections
- Simple and critical plane methods
- Auto-mode available for multiaxial loadings
- Rainflow counting and linear damage summation
- Mean stress correction by Morrow, SWT, or interpolation
- Static failure checking and statistics
- Back calculations on scale factor
- Maintains correct cycle sequence for accurate positioning of hysteresis loops

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

Spot Weld analyzer
- Spot weld fatigue analysis using the Rupp/LBF approach
- Bar, CWELD and ACM representations supported

Main Features, continued

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

General usage

- GUI is developed within the GlyphWorks framework. See GlyphWorks spec sheets for general features and additional processing options
- Simple intuitive interface with drag and drop input for FE models and loading inputs
- Define the whole analysis process graphically from a single screen
- Create and save processes for re-use
- Create custom CAE fatigue analysis glyphs

Platform support

- Windows 2000, Windows XP, Windows XP-64, HP-UX 11.11
- Supports multiple processors on the same node

DesignLife Components

DesignLife includes the following components, which are common with ICE-flow GlyphWorks Fundamentals**:**

Desktop environment
Studio module for viewing data and creating report templates
GlyphWorks environment
Flowproc batch processing of GlyphWorks processes
ASCIITranslate module for converting ASCII data to binary time series and multi-column
KAMTranslate module for converting ACRA KAM-500 data.

Input Glyphs

HistogramInput	Accesses Histogram data type
MetadataInput	Accesses XML format metadata files for the purpose of adding or changing metadata
MultiColumnInput	Accesses Multi-column data which is an 'n' x 'm' table of data
TSInput	Accesses Time Series (constant x-axis increment) data
TSGenerator	Defines a channel of data

Function Glyphs

Arithmetic	Performs basic mathematical functions on time series or histogram data
ButterworthFilter	Up to 8th order forwards or forwards/backwards Butterworth filtering
Concatenation	Appends time series data together
ChannelReassignment	Renumbers channels of time series or histogram data
Differentiation	Performs differentiation on time series data
Extraction	Extracts a section of time series data
FrequencySpectrum	PSD, Amplitude or ESD frequency spectrums from time series data
HistogramManipulation	Performs functions on histogram data such as exceedance summation and closing residuals
Integration	Performs integration on time series data
MetaDataManipulation	Combines metadata from one set of data to another
MetaDataCalculator	Creates or edits metadata
MetaDataToHist	Creates a histogram from user selected metadata item
MultiColumnCalculator	Performs mathematical operations on columns of multi-column data
MultiColumnManipulation	Performs specific functions on multi-column data
MultiColumnToTimeSeries	Converts multi-column to time series data
RunningStats	Calculates requested statistic on a sliding window of data
SampleRateAdjust	Adjusts sample rate of time series data
Statistics	Calculates time series statistics including standard deviation, kurtosis and skewness
TestCombination	Combines channels from two tests
TestSplitter	Uses logical functions to extract channels from a test
TSCalculator	Creates derived time series channels via math operations, with logical operations
TimeSeriesToMultiColumn	Converts time series to multi-column data
UnitsConversion	Converts time series data and labels using configurable units system

DesignLife Components, continued

Display Glyphs

AuditDisplay	Views and exports audit report file
DataValuesDisplay	Views values of time series, histogram and multi-column data, optionally exports ASCII csv files
HistogramDisplay	Provides dynamic 3D plotting of histogram data
MetadataDisplay	Metadata viewed as tree or configurable table
XYDisplay	2D plotting of time series, histogram and multi-column data
StudioDisplay	Report creation based on Studio templates

Output Glyphs

HistogramOutput	Writes out histogram data type
MultiColumnOutput	Writes out multi-column data type
TSOutput	Writes out time series data type
MetaDataOutput	Writes out meta data to XML

In addition, DesignLife includes the following components:

ScheduleCreate module for creating XML schedule and CAE duty cycle files for multiple events
MaterialsManager module for viewing and editing materials data
Super Glyph creates a single glyph from a sub-process of multiple glyphs which can be saved and re-used - includes SG Loop Control Glyph
FE-Display enables the graphical display of FE models, with contours of stress analysis results and fatigue results within Studio and the FE input and display glyphs

DesignLife Glyphs

FE Input	Enables access and display of FE models and anslysis results
FE Display	Enables postprocessing of fatigue results on the FE model
FE Output	Enables fatigue (or other multi-column data) to be output in common FE formats for postprocessing
Hot Spot Detection	Identifies critical locations
CAE Fatigue Glyph	Performs all FE-based fatigue analyses, with functionality depending on licensed options and configurations. A set of standard configurations is included

Licensed Options:

- Strain-Life solver
- Stress-Life solver
- Dang Van solver
- Spot Weld solver
- Seam Weld solver
- Vibration Fatigue - requires S-N solver
- Advanced edit - create and edit fatigue configurations
- Parallel processing - additional threads

Licensed options depend on which package you purchase. Please contact nCode or your local representative for details.

Optional GlyphWorks Modules:

- Signal
- Frequency
- Accelerated Testing
- Anomaly
- Crack Growth
- Fatigue
- Fatigue Editing
- Open Glyph and Super Glyph
- GPS Display
- IMSL Statistics
- ASAM ODS

The features described in this document are summary and based on ICE-flow GlyphWorks and DesignLife version 4.1.