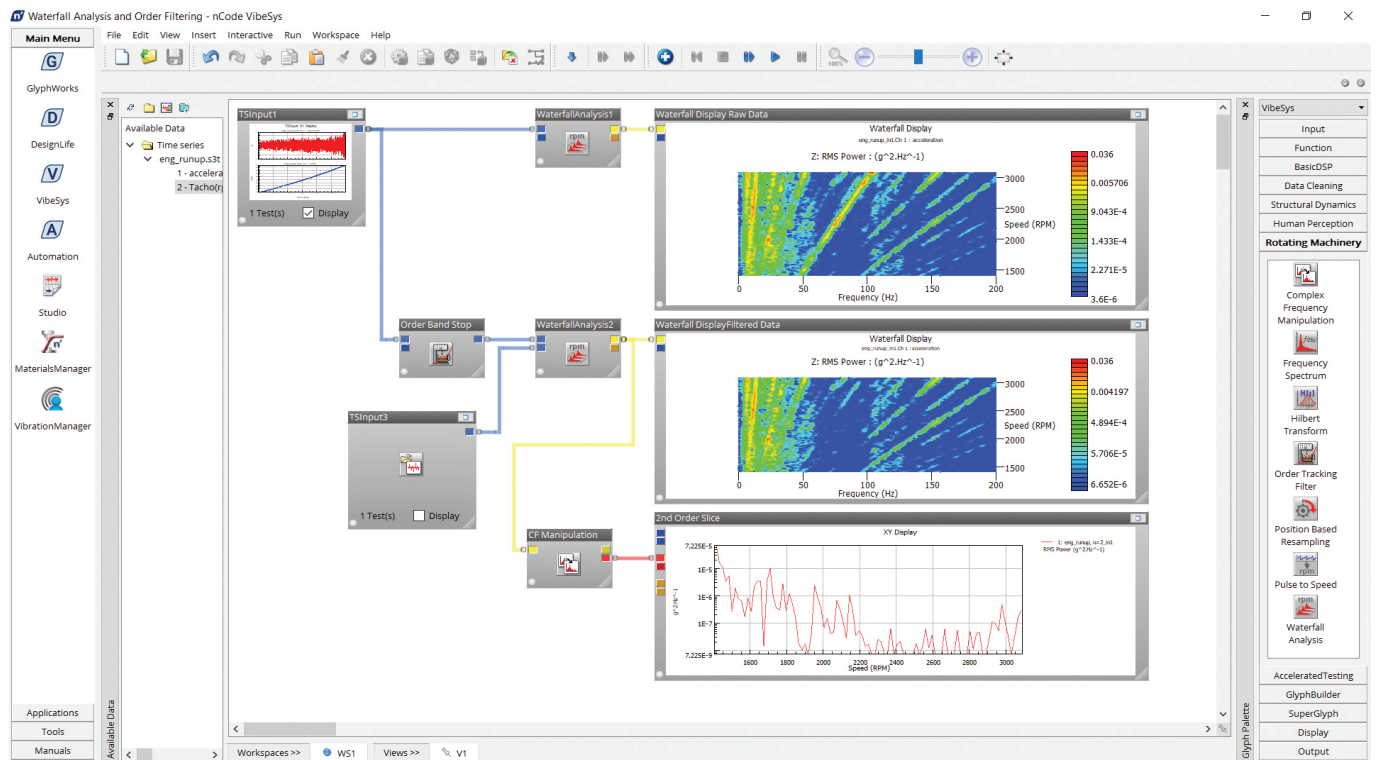


VIBESYS

Powerful Vibration Analysis

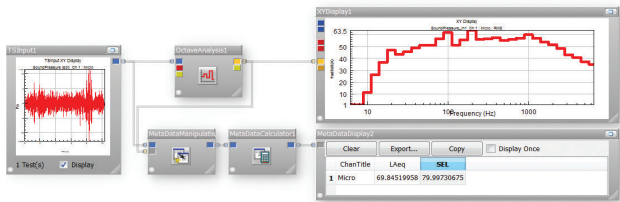
nCode VibeSys is a data processing system with analysis capabilities for early fault detection in rotating machinery, rating human reactions to sounds and vibrations, and for characterising the dynamics of a structure.



BENEFITS

- **Save time and cost** with faster, more meaningful fault detection and diagnostics for rotating machinery
- **Improve consistency and quality** with standardised analysis processes
- **Gain insights and increase productivity** with 'one-click' generation of results and reports
- **Easily process** huge amounts of data in a wide range of formats in the frequency domain

Core functionality for performing vibration and frequency domain analysis



Designed for frequency domain analysis, VibeSys enables reliable products to be designed that satisfies customers' expectations in terms of sound, comfort, and regulatory requirements.

NCODE FUNDAMENTALS

nCode Fundamentals provides visualisation and basic manipulation of data, frequency spectrum analysis, filtering capabilities, and reporting. It is included in the base package of VibeSys and is a prerequisite for all other product options.

NCODE FUNDAMENTALS FEATURES

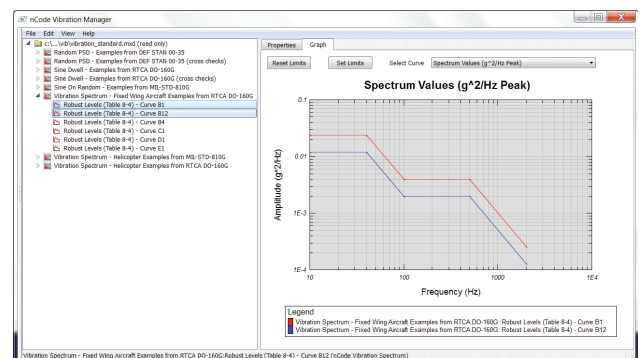
- Input/output support of multiple data formats
- Visualisation and reporting
- Frequency Spectrum (Amplitude, Power, Energy)
- Filtering (IIR and FIR) and resampling
- Extraction and concatenation
- Statistics and running statistics, including higher order standardised moments such as kurtosis
- Unit conversion
- Time at level analysis
- Probability density functions
- Graphical editor
- Channel calculator
- Batch and interactive interfaces
- SuperGlyph to encapsulate multiple analysis functions as a single glyph
- Electric power analysis to estimate the efficiency of electric powertrains from measured currents and voltages

VIBRATION MANAGER

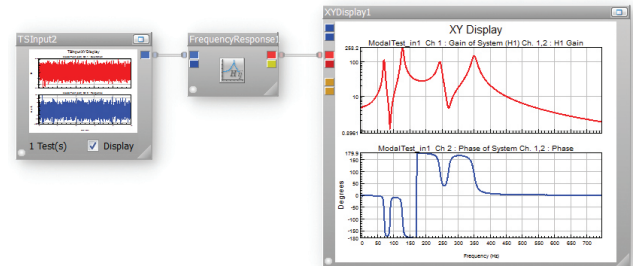
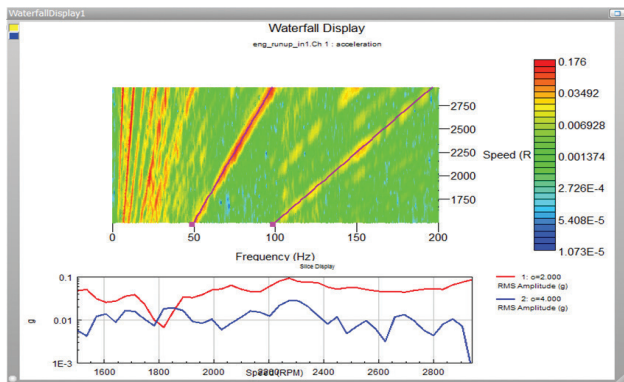
The Vibration Manager module provides the ability to enter, edit, and view vibration specification data.

VIBRATION MANAGER FEATURES

- A database that contains over 100 vibration entries. This includes UK DEF STAN 00-35 Part 3 Issue 4 Chapter 2-01 Annex A, USA MIL-STD- 810G Method 514.6 Vibration Annex C, Civil Aircraft Standard RTCA DO-160G, the Electric Vehicle Battery Test Procedures Manual, Revision 2, Published January 1996, and ISO 16750-3:2012 describing the mechanical loads for electrical and electronic equipment in road vehicles
- Up to 16 vibration curves can be overlaid for graphical comparison
- Data import/export capabilities via XML files
- Filters to find curves of interest within database



Dedicated analysis for acoustics and vibration



ROTATING MACHINERY

Rotating Machinery features a set of predefined processes for detecting early symptoms of noise or vibration problems in rotating machinery and identifying their root cause. For instance, electrification engineers can analyse undesired vibration due to the non-sinusoidal nature of electric signals produced by inverters.

ROTATING MACHINERY FEATURES

- Pulse to speed conversion
- Waterfall analysis from run up/down, constant or non-monotonic speed profiles
- Orders extraction in both time and frequency domain
- Order tracking filter for sensitivity analysis and sound quality
- Signal playback
- Revolution domain resampling, order spectra and waterfalls
- Waterfall display and Campbell plots
- Resonance or custom cursors
- Cepstrum analysis
- Global and running kurtosis
- Signal envelope for demodulation analysis

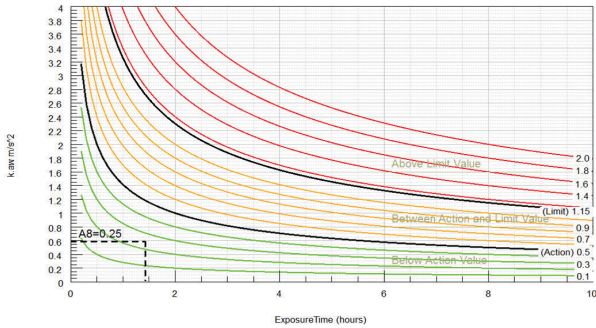
STRUCTURAL DYNAMICS

Structural Dynamics contains functions designed to characterise the dynamics of a machine or structure in terms of its mode of vibration.

STRUCTURAL DYNAMICS FEATURES

- Frequency Response Function (FRF) with Gain (H1, H2) phase, coherence, auto and cross spectra
- Waterfalls of FRF to check for linearity
- Custom Fast Fourier transform (FFT) filter to apply a transfer function defined as gain and phase spectra
- Convolution to filter from an impulse response function
- Auto/cross correlation
- Hilbert transform to calculate the decay rate of an impulse response function from its envelope
- Horizontal and vertical cursors on spectra to identify resonances and damping ratio

Whole Body Vibration: A(8) Daily Exposure Graph (Weighted RMS acceleration in m/s²) Z Direction



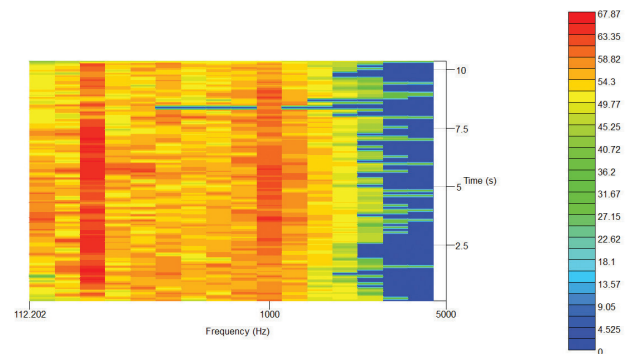
The whole body vibration analysis results from VibeSys help engineers understand the perceived quality of a product and assess the health effects related to extended exposure to high levels of vibration.

HUMAN PERCEPTION

Human Perception includes standard processes for assessing whole body comfort and health. Specific functionality includes vehicle ride quality analysis and hand-arm vibration assessment.

HUMAN PERCEPTION FEATURES

- Readily available processes for finding the frequency weighted RMS acceleration to obtain crest factor and Vibration Dose Values (VDV) – eight hours combined vibration total value, eight hours VDV, etc.
- Sound level indicators such as L_{Aeq} , eight hours L_{Aeq} , SEL, L_{AE} , etc.
- Octave-band or fractional-octave spectra analysis capabilities from data in the time domain, PSD, or waterfalls – in linear or dB scales
- Psychoacoustics including A, B, C noise filters
- Order tracking filters with analysis playback capabilities
- Weighting filters for human body vibration in accordance with ISO 2631 and ISO 5349
- Calculation of sound quality metrics, for example, loudness, sharpness and articulation index



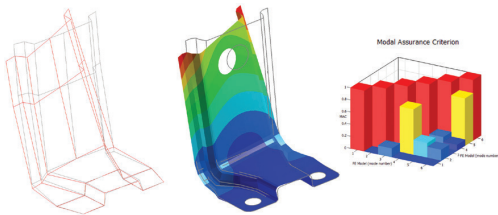
VibeSys options

MODAL ANALYSIS

The Modal Analysis module is a specialised product option for extracting modal parameters from test data. Synchronous animation of the simulation and test mode shapes, as well as the determination of the Modal Assurance Criterion enable **correlation between test and CAE**.

MODAL ANALYSIS FEATURES

- More accurate damping ratios through enhanced FE modelling
- Modal Assurance Criterion (MAC) analysis to determine the similarity of mode shapes by comparing the response motion captured using virtual sensors with the measured displacements
- Validate FE modelling using MAC analysis or synchronous animations to compare the mode shapes with the test model
- 'AutoMAC' matrix to help position virtual sensors and optimise physical instrumentation to capture the modes of interest
- Structural health monitoring by tracking changes in modal parameters due to damage



VIBRATION PROFILE DESIGN

Vibration Profile Design (formerly Accelerated Testing) provides the ability to create a representative PSD or swept sine shaker vibration test based on measured data for assessing the impact on shock and fatigue damage. It uses the fatigue damage spectrum (FDS) approach as described in NATO STANAG 4370 (AECTP-240)/UK DefStan 00-35/Mil-Std-810G, allowing users to tailor vibration tests to a target vibration environment. Users can also compare existing test evidence against the requirements of a known test specification. It enables assessment of whether components in service will likely survive to the target service life. This known safety margin may help extend the life of parts in service or conversely avoid unexpected failures.

GLYPHBUILDER

The GlyphBuilder option enables users to add their own unique or proprietary methods and file formats by combining the capabilities of the Scripting and OpenGlyph. In the Scripting glyph, users can define their own processes by using either MATLAB or Python programming language.

The OpenGlyph gives direct access to external applications from within a VibeSys process. A given command line operation is executed from within this glyph so that external code or scripts such as Visual Basic®, Java™, nCL, C++, etc., can all be called using data from the process.

MEDIA DISPLAY

The Video Player and Media Display glyphs enable multiple synchronised videos and audio signals to be played alongside measured data. They also enable cursor synchronisation with other data displays to gain insight on what was occurring in other signals. The Gauge Display glyph enables synchronised values to be displayed during playback in a variety of styles such as angular gauges or digital read-outs.

DATA CLEANING

The Data Cleaning option provides advanced data cleaning techniques beyond what is possible with classical filtering techniques alone. This option includes the Wavelet Denoising glyph that enables noise to be separated out from signals by decomposing data into the combination of 'wavelet levels'. It also includes the Kalman Filter glyph, which accounts for noise in measured data using a physics model that predicts, given the current point, where the next point will be.

EXPLORE OTHER NCODE SOLUTIONS

nCode GlyphWorks

Data processing system for signal processing and durability analysis.

nCode VibeSys

Data processing system for vibration analysis.

Aqira

Standardise engineering processes, perform streamed data analytics, and manage data.

Premium Materials Database

High-quality fatigue parameters of steels, aluminium alloys, and additive manufacturing materials.

ABOUT US

We help engineers deliver durable and reliable products and avoid the cost of unexpected failures. Our software brands for durability and reliability, nCode and ReliaSoft, empower data-driven confidence through accurate analysis and simulation, enabling customers to achieve success through failure prediction.

For more information, please visit: www.hbkworld.com

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