DIGITAL INDUSTRIES SOFTWARE

Simcenter Anovis Software for industrial testing

Simcenter/AN-ELT.002/2023/20231207

Product Information Sheet

Summary

ANOVIS - Acoustic Noise and VIbration Signal analyzer is a comprehensive system for analysis and rating of the noise and vibration at the production line.

Simcenter Anovis Lab System provides a full-featured application for quality assessment of rotating machines that can be used beside the test bench on an office PC. It's especially designed for comprehensive off-line analysis of signal files provided by Simcenter Anovis test bench systems. Additionally, Simcenter Anovis Professional includes all functionality necessary for statistical analysis of measurement data and complete configuration of measurement setups including a full functionality for data visualization.

BENEFITS

- Off-line analysis of recorded signal data and measurement results
- Detection and identification of faults only visible in noise and vibration
- Precise fault identification to reduce repair time and to provide reliable production statistics
- Modular system: Anovis can be adapted to a wide variety of applications without the need of programming
- Includes all functions necessary for off-line analysis, where comprehensive visualization is required and all functionality of the Simcenter Anovis system is needed.

Testing aims to identify one or a combination of the following specific quality defects:

- assembly faults
- damage
- untypical noises or vibrations

The Simcenter Anovis Acoustic noise and vibration testing technology provides numerous technical opportunities, including:

- delivering an objective and reproducible test method,
- detecting faults that are not picked up by standard test-bench technology,
- enabling an assessment of the acoustic performance of the whole unit,
- providing fault diagnostics support (identification of defective components) and helping to improve overall process reliability).

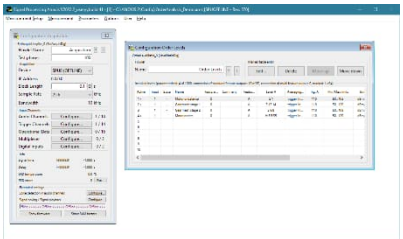
The main economic benefits include:

- objective monitoring of the factory-specific quality standard,
- fewer returns and customer complaints leading to greater trust, and
- increased efficiency thanks to automated fault diagnosis.

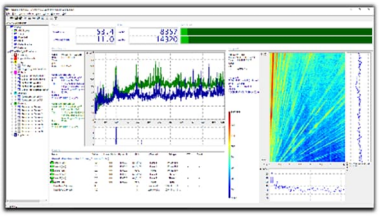
Anovis-Lab System

Components

Simcenter Anovis Signal Processing Software to load and operate measurement setups designed with the Simcenter Anovis Lab Software or with Simcenter Anovis Professional itself for off-line analysis only



Simcenter Anovis Analyzer Software with full functionality to present the test results in different ways.



Additionally, functionality for off-line and on-line statistics as well as off-line data visualization is included.

Signal Processing and Metric calculation

The following signal processing modules are included in Simcenter Anovis Lite (in alphabetical order):

AngleFeatures: Metric calculation based on angle synchronous signal

AngleSyncAvrg: Angle synchronous averaged signal

Audio2Tacho: Creating a tacho signal from a time signal based on several algorithms

Calib: Manual and automatic calibration of time signal including sensor definition

Differentiator: Differentiation of time signal

Envelope: Calculation of a time signal envelope

FeatureAverage: Averaging of feature vectors

FeatureDifference: Difference calculation of two vector features

FeatureDiffweight: Difference weighting of feature vector

FeatureNormalise: Variance weighted normalization of a feature vector

FeatureTolerance: Rating of an input vector with a tolerance vector

FeatureToleranceScheme: Rating of an input vector with a tolerance vector, enhanced functionality

Filter: Filtering of a time signal with a FIR-Filter (LP, HP, BP, user-defined filter coefficients)

FreqAnalysis: FFT-Analysis of a time equidistant signal including windowing and optional a-weighting, FFT-length 64 to 32768

FreqAnalysisWithRpm: Like FreqAnalysis, but with additional revolution speed processing

FreqLevelAvrg/FreqLeveRatio: Calculation of frequency levels (single, harmonic, range, overall, user, sideband metrics and combinations thereof)

FreqLevelAvrgWithRpm: Like FreqLevelAvrg, but with revolution speed processing

FreqLevelTrackVsRpm: Calculation of frequency level tracks vs. revolution speed (single, harmonic, range, overall, user and combinations thereof)

FreqLevelTrackVsTime: Calculation of frequency level tracks vs. time (single, harmonic, range, overall, user and combinations thereof)

FreqLevelTrackVsRef: Calculation of frequency level tracks vs. arbitrary reference (single, harmonic, range, overall, user and combinations thereof)

FreqSonagramVsRpm: Calculation of frequency-revolution-speed sonagrams (Campbell diagrams)

FreqSonagramVsTime Calculation of frequency-time sonagrams

FreqSonagramVsTimeWithRpm: Calculation of triggered frequency-time sonagrams with additional revolution speed processing

FreqSpec: Calculation of a free running or triggered frequency spectrum (auto-spectrum, peak-hold, power cepstrum modulation spectrum)

FrequencyFeatures: Identification of resonance features in an averaged frequency spectrum (auto-spectrum in dB)

Integrator: Integration of time signal

MathAbs: Absolut value calculation of any input data

MathClip: Range limiting (clipping) of any input data

MathFunc: Calculation of abs, sqr or sqrt of any input data

Message2Data: Synchronization of trigger messages and data channels

OrderAnalysis: Turn angle equidistant resampling of a time signal including FFT calculation including windowing variable overlapping. Maximum order 1000, maximum order resolution 999 lines, product of max order and order resolution ≤ 12800

OrderFeatures: Calculation of metrics from averaged order spectrum

OrderLevelAvrg/OrderLevelRatio: Calculation of order levels (single, harmonic, range, overall, user, sideband metrics and combinations thereof)

OrderLevelTrackVsRpm: Calculation of triggered order level tracks vs. revolution speed (single, harmonic, range, overall, user and combinations thereof)

OrderLevelTrackVsTime: Calculation of triggered order level tracks vs. time (single, harmonic, range, overall, user and combinations thereof)

OrderLevelTrackVsRef: Calculation of triggered order level tracks vs. arbitrary reference (single, harmonic, range, overall, user and combinations thereof)

OrderSonagramVsRpm: Calculation of order-revolution vs. speed sonagrams

OrderSonagramVsTime: Calculation of order vs. time sonagrams

ResamplingChannel: Turn angle synchronous resampling of time equidistant signals (linear or quadratic interpolation of angle times)

ResonanceScale: Calculation of the auto-spectrum with optional resonance normalization

ResultBuf: Collecting and storing of result buffers resp. making data buffers available for display

RpmChannel: Conversion of tacho data into a revolution speed channel

RpmModulation: Calculation of modulation-based metrics from RPM signal

RpmProfile: Profile of revolution speed vs. time

RpmTrigger: Generation of trigger messages from revolution speed and test stage information

SignalDemodulation: Demodulation of time signal, analysis of frequency inverter noises

SignalGen: Generation of test signals for evaluation of flowlet output

SpectrumAveraging: Calculation of averaged spectra with optional tolerance vector rating

SpectrumAveragingBasic: Calculation of averaged spectra

SpeedChannel: Logical distance-speed channel

SrdAcquis: Connector for all types of standard Anovis signal recording devices (SRD)

TachoConvert: Conversion of special tacho signals from IC engines

ThirdOctaveSpectrum: Calculation of third octave spectra from time signals

TimeSignalAnalysis: Metric calculation from time signal including rating (min, max, mean, RMS, power, peak, range, crest, median, std, kurtosis, excess, skewness)

TimeSignalFeatures: Metric calculation from a signal vector vs. time (min, max, mean, std, maxpos, minpos, emean, esum, sum, crest, cnt, area-min/max/total, l-area-min/max/total)

TimeSignalProfile: Signal profile vs. time with min-max-reduction and optional percentile calculation

TimeSignalProfileWithRpm: Like TimeSignalProfile, but with RPM processing

TriggerAudioExtTrig: Trigger module to generate trigger messages based on external triggers, signal events and phases

TriggerPulseSplitter: Splitting of a trigger/tacho signal

TriggerTime: Special flowlet to display the trigger timings

VarWriter: Collects data buffers to be displayed in the Anovis Analyzer without rating and saving as result file

VectorCombine: Calculates combination of asynchronous calculated data vectors (Min, max, mean, diff, sum, emean, esum)

VectorFeatures: Metric calculation from a signal vector (min, max, mean, std, maxpos, minpos, emean, esum, sum, crest, cnt, area-min/max/total, l-area-min/max/total))

VectorModulation: Calculation of modulation-based metrics from signal vector

WavAcquis: Connector for Windows sound devices (for educational purposes only)

Visualization

Results created from the Simcenter Anovis Signal Processing software can be displayed in the available viewers. The viewers contain comprehensive functionality to show single measurement results, like zoom, cursors, markers etc. The following data viewers are included in Simcenter Anovis Lite (in alphabetical order:

Alarm signs: Visualization of one or more metrics as color field in green/red/orange depending on the result including supplementary information about the displayed data.

Bar vector: Visualization of third octave spectra as bars including supplementary information about the displayed data and the test run.

Bitmap: Displays a user defined bitmap

Digits: Visualization of one or more metrics as digit in blue/red depending on the result including supplementary information about the displayed data.

Level meter: Visualization of signal levels and metrics as bar graph with limits

Lines: Visualization of vectors as line including supplementary information about the displayed data and the test run with optional tolerance window.

On-Line-Statistics: Visualization of one or more metrics as trend and histogram including assessment limits including supplementary information and statistics about the displayed data.

Table: Visualization of one or more metrics as chart with icons in green/red/orange depending on the result including supplementary information about the displayed data.

Lists: Visualization of text output provided by several flowlets as list. I.e., on-line classification results

Scrolling Sonagram/Sonagram: Visualization of 3D results like time-frequency representations of spectral data, Campbell-diagrams, order sonagrams etc.

Analysis: Simultaneous visualization of a large number of measurements in the form of a set of curves. The measurements can be divided into different classes, which supports the analysis of deviations and the definition of metrics, as well as the definition of tolerance curves.

Off-line statistics: Simultaneous visualization of a large number of metrics from different measurements as trend and histogram with supplementary information. The measurements can be divided into different classes, which supports the analysis of deviations and the definition of limits for the metrics.

Variables: Integration of control elements like buttons, spin buttons and strings for interaction with the measurement setup.