

# SO Analyzer

## Rotate Acquisition and Analysis

The Rotate Acquisition and Analysis software package is part of m+p international's SO Analyzer for noise & vibration measurements and analysis. It is designed for troubleshooting and analyzing noise or vibration problems related to the speed characteristics of rotating or reciprocating components of a machine in operation.

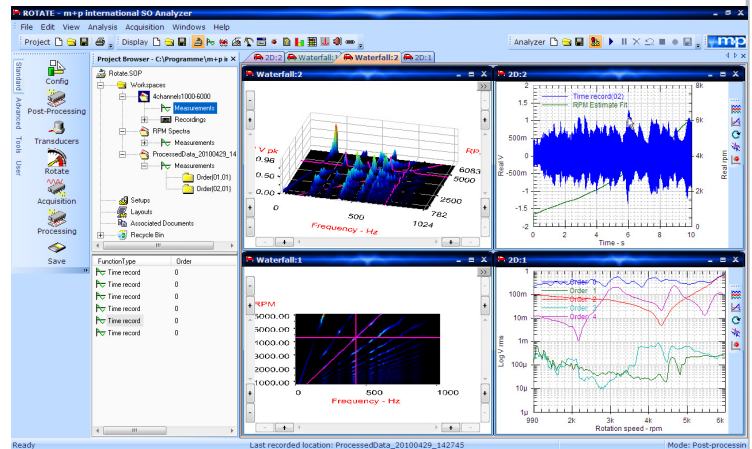
### Key Features

#### Tacho Based Spectral Mapping & Order Tracking

- Data collection, analysis and reporting in one package
- Processing of analog and digital tacho signals
- RPM or time dependant triggering
- Real-time and computed order tracking
- Real-time waterfall display
- Tacho Spline Fit calculates RPM versus time from the raw tacho signal
- RPM Spectral Map creates a 3D plot of amplitude versus frequency versus RPM or time
- Frequency Order Tracking cuts orders from the Spectral Map
- MS Windows like user interface
- Intelligent wizards for easy and safe user guidance
- Copy&paste to ActiveX applications like MS Word and PowerPoint
- Free installation of the SO Viewer to actively view/analyze data like an animation display on any MS Windows/Office PC

#### Orbit Analysis Wizard

- Study of displacement transducers on rotating machinery
- Calculating and averaging single/multiple rotations over time



### Applications

- Rotating machinery diagnostics
- Analysis of noise and vibration problems related to rotational forces, e.g. in automotive and aircraft engines, transmissions, gearboxes, compressors, pumps, turbines, electric motors
- Order analysis

## Overview

With the SO Analyzer Rotate software, the acquisition of spectra for an online waterfall display can be triggered based on RPM or time values, and orders can also be acquired and displayed online. The simultaneous acquisition of vibration and tacho signals as time records (throughput recording) additionally allows offline postprocessing analysis with spectral maps and advanced computed order tracking. A spline fit algorithm converts the digital or analog tacho signal to an RPM versus time signal, thus assigning an RPM value to each data sample. Spectral maps with a variable resolution and orders, including fractional values, can be computed from these data. The advanced TVDFT (Time Variant Discrete Fourier Transform) algorithm is applied for the Computed Order Tracking analysis. The TVDFT algorithm provides the benefits of both the computation speed of the FFT based order tracking and the precision of the resampling technique.

The Windows-based Rotate software uses intelligent wizards that, step by step, guide through the process of performing a rotating machinery data acquisition and analysis. Waterfall and 2D graphs can be directly copied and pasted into ActiveX compliant applications such as Microsoft Word or PowerPoint. Once imported into these applications, all SO Viewer properties such as data rescaling, reformatting, animating, etc. stay active. The SO Viewer can be installed on any PC at no extra cost so colleagues and customers can benefit from these facilities.

## Rotate Data Acquisition

- Unlimited and freely definable list of user specific header information (metadata) for annotation, data retrieval, sorting and reporting
- Simple parameter entry for the channels in tables including engineering units, transducer calibration data and inputs
- Channel type: excitation, response, inactive; DC or AC coupled; input range, offset, pregain, acoustical weighting; FIR weighting filters hand, arm, body, user defined
- Channel input: V, ICP, Charge
- Enter transducer calibration data or import from Excel
- Acquisition setup: sample rate or useful bandwidth, blocksize, arming
- Multiple analog tacho channels or digital counter for high resolution
- User settings for pulse per revolution are used to compute the speed from a time domain waveform
- Level trigger and pretrigger view
- RPM extraction from analog channel or from digital tachometer (counter) input
- Triggering based on RPM or time values; start, stop and step size
- Acquisition of run up, run down, run up and down, run down and up
- RPM values are stored per data block (analog tacho) or per data sample (digital tacho)
- 0.1 order resolution
- Data processing/data storage: time record, spectrum, PSD, cross-PSD, FRF, order
- Averaging: none, linear, exponential
- Windows: uniform, hanning, hamming, flattop, exponential
- Overload handling: ignore, retry or break
- Autoranging: instant graphical feedback, automatic/manual ranging, range up only
- Save and recall measurement and display setups
- Save calculated functions
- Online display formats: 2D, 2D-RPM, 3D (waterfall), 3D-RPM

## Rotate Analysis

### Tacho Spline Fit

- Pulses per revolution: any number, also fractional
- Cursor selection of time record range for spline fitting
- Set trigger level, slope, holdoff
- Deselect dropouts or peaks for correcting RPM estimates from noisy tachometer signals
- Any number of spline knots

### Spectral Map

- Select time records and phase reference for RPM analysis
- Select start time, end time and time step
- Block size from 128 to 32768 samples
- Windows: uniform, hanning, hamming and flattop

### Frequency Order Tracking

- Cut and save orders from the spectral map
- Cut and save stationary signals at a fixed frequency from the spectral map (amplitude versus RPM/frequency)
- Cut and save spectra (fixed RPM) from the spectral map

### Computed Order Tracking

- Analysis uses the Time Variant Discrete Fourier Transform method
- Any combination of channels and orders; orders can be integer or fractional
- Select time records and phase reference for order analysis
- Windows: uniform, hanning, hamming, flattop and blackman
- Select start RPM, end RPM, RPM step

## Viewers/Post-Processing

### 2D Viewer<sup>1)</sup>

- Same display functionality online and offline
- Unlimited number of displays and unlimited number of traces per display
- Change appearance of chart, plot area, axes, grids, traces, cursors
- Add header information to display
- Y-axis type: real, imaginary, amplitude, phase, log, dB, real+imaginary, amplitude+phase, log+phase, dB+phase, Nyquist
- Y-axis scaling: autoscale, free, fixed, rms, peak, peak-peak with automatic data conversion
- X-axis type: lin, log, octave
- X-axis scaling: autoscale, free, fixed
- Unlimited number of cursors
- Cursor functions: harmonic, nudge, seek to peak, seek to max, show value, show difference, RMS and Q-factor calculation between/at cursor(s)
- Display Calculator functions: acoustic weighting and unweighting, fft, 1/1 and 1/3 octave, integrate, differentiate, square root, orbit
- Zooming, scrolling and rescaling with mouse, scroll mouse or keyboard entry

- XYZ Cursors and harmonic cursors
- Y-axis: real, imaginary, phase, log, dB; rms, peak and peak-peak scaling
- X-axis: lin, log, octave, order
- Z-axis: rpm, time, order, Z, record number
- Zooming and rescaling with the mouse

### Post-Processing

- Data import/export<sup>1)</sup>
- All processing can be done from imported time domain signals
- Unlimited open workspaces
- Drag/drop data combining from open workspaces
- Advanced calculator for non-standard calculations

### 3D/Waterfall/Spectral Map Viewer<sup>1)</sup>

- Same display functionality online and offline
- Unlimited number of displays and up to 1024 traces per display
- Change appearance of chart, plot area, axes, grids, traces, cursors, colors
- Traces as line, plate, shaded plate, surface, shaded surface, bar, shaded bar, 2D color plot XZ and ZX, colors configurable

<sup>1)</sup> see the m+p international e-Reporter Product Information

## Orbit Analysis Wizard

This optional wizard is used for the study of displacement transducers on rotating machinery. Single rotations as well as multiple rotations can be calculated and averaged over time. A simple configurable bandpass filter can also be applied to remove unwanted signal/noise.

- Select a pair in x- and y-axes manually
- Select the moment (or the order) at which the calculation is applied
- Select the rpm for which the calculation is applied
- Visualize the instationary orbits or the average for n revolutions
- Apply a high-pass and/or low-pass filter
- Shift the orbit presentation out of phase

Continuous sampling is possible using the Play/Slow/Fast buttons. The orbit diagrams can be analysed and filed away by means of the usual SO Analyzer commands for graphical analysis.

## Operating System

- Microsoft Windows XP/Vista/7

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