Vibrant Technology, Inc. is a leader in developing software tools for post-processing vibration and acoustic test data.

In 2011, we celebrated our 20th anniversary with customers and OEM resellers around the globe. Our software packages are used by structural testing and machinery maintenance professionals worldwide in a wide variety of industries.

The primary products of Vibrant Technology are the ME’scope series of software tools for analyzing vibration and acoustics problems in structures, and the MechaniCom Surveillance System. MechaniCom is a turn-key, 24/7, real-time system that can be used for continuous monitoring and predictive maintenance of rotating and reciprocating equipment, and for structural health monitoring.

ME’scope is designed to aid engineers in understanding and solving structure-born noise and other vibration-related problems. It can be used for troubleshooting problems in operating machinery, civil structures, mechanical structures, and electro-mechanical systems. ME’scope is also the heart of the MechaniCom Surveillance System. MechaniCom gives operators the ability to monitor the health and operating condition of their critical machinery from the plant floor, their desk, or on the go. Both ME’scope and MechaniCom are available worldwide through a network of sales representatives and OEMs.

Vibrant’s principals have more than 80 years combined experience in the design and development of testing and analysis systems.

Dr. Mark Richardson, the company CEO and President, has over 35 years of experience in the development and use of software-based vibration testing and analysis systems. Dr. Richardson was integrally involved in the development of the first commercially available FFT-based modal testing system, introduced by Hewlett Packard in 1974. While at HP, he also directed the development of the first dedicated modal testing instrument, the HP5423A Structural Dynamics Analyzer, introduced in 1979. In 1979, Dr. Richardson and his partners founded Structural Measurement Systems, Inc. (SMS). While under Dr. Richardson’s direction as its CEO and President, SMS became a leading world-wide supplier of modal testing software, including software for mini-computers, desktop computers, and the popular IBM PC-based STARModal software. Dr. Richardson is also one of the original developers of the Rational Fractional Polynomial curve fitting algorithm which is used for extracting modal parameters from experimental data.

Vibrant Technology is headquartered in Scotts Valley, California. Scotts Valley is located near Santa Cruz, CA along the Central California coast about 1/2 hour south of San Jose.
What is ME’scopeVES?

The ME’scopeVES Visual Engineering Series of software packages and options makes it easier for you to observe and analyze noise & vibration problems in machinery and structures using either experimental or analytical data.

With ME’scope, you can import or directly acquire multi-channel time or frequency data from a machine or structure, and post-process it. Its industry-leading interactive 3D animation allows you to observe order-related operating deflection shapes from running machinery, resonant vibration and mode shapes from real structures, acoustic shapes, and engineering shapes directly from acquired data.

In addition to its photo-realistic interactive animated display, ME’scopeVES contains state of the art tools for performing:

- FRF-Based Modal Analysis
- Operational Modal Analysis
- Vibro-Acoustic Analysis
- Dynamics Modeling & Simulation
- Structural Dynamics Modification
- Experimental FEA

ODS Animation

An Operating Deflection Shape (ODS) is the simplest way to see how a machine or structure moves during its operation, either at a specific frequency or moment in time. An ODS contains the overall dynamic response of a structure due to forced and resonant vibration.

Time-based ODS animation sweeps a cursor through a set of time histories describing motions at multiple points and directions on a test article. You can stop the animation, back it up, and play it forward to observe in slow-motion phenomena that may have taken place very quickly in real time.

With frequency-based ODS animation, you simply move the cursor to a frequency of interest in your data, and the ODS for that frequency is displayed. With this animation, you can observe resonant vibration as well as order-related and other types of forced vibration.
FRF-Based Modal Analysis

Modal analysis is used to characterize resonant vibration in mechanical structures. Each resonance has a specific "natural" or modal frequency, a modal damping or decay value, and a mode shape. FRF-Based parameter estimation (or curve fitting) is used to estimate the modal parameters of a structure from a set of FRFs.

At the heart of the Basic Modal Analysis option is the ME'scope Polynomial method, an easy to use MDOF curve fitter. This curve fitter can be used to simultaneously extract parameters for multiple modes, especially in cases of high modal density. It can also extract local modes where the resonant vibration is confined to a local region of the structure.

The Multi-Reference Modal Analysis option contains all of the features of the Basic Modal Analysis option, plus additional methods for curve fitting a multiple reference set of FRFs. Multi-Reference curve fitting is used to extract closely coupled modes and repeated roots (two or more modes at the same frequency). This option contains a Stability diagram for locating stable pole estimates, and three additional curve fitting methods: Complex Exponential, Z-Polynomial, and the patented AF Polynomial method.

Operational Modal Analysis

When the excitation forces causing a structure to vibrate are not measured, then FRFs cannot be calculated, and modal parameters can only be extracted for output-only or operational measurements. Nevertheless, a key advantage of OMA is that data can be acquired under real-world operating conditions.

This option contains all of the features of the Multi-Reference Modal Analysis option, plus special tools for curve fitting measurements obtained from output-only or operating data. A common OMA measurement is a Cross spectrum, which is calculated between a roving accelerometer and a reference (fixed) accelerometer. After a set of Cross spectra has been specially windowed, they can be curve fit using FRF-based curve fitting methods to obtain operating mode shapes.
Vibro-Acoustic Analysis

This option post-processes and displays Acoustic Intensity, Sound Pressure Level (SPL), and Sound Power. It allows you to analyze vibro-acoustic problems by displaying both vibration and acoustic data together in the same animated picture.

Acoustic Intensity is measured with a two to four channel acquisition probe and a multi-channel acquisition system. Each Intensity measurement is made either normal to an acoustic grid or surface, or in three directions (tri-axially) at each grid point.

Sound Power flow through an acoustic surface is calculated from Intensity data. Sound power is displayed on the acoustic surface using a color map.

Interactive Source Ranking allows you to graphically document the breakdown of acoustic energy measured from various components of a test article. Acoustic sources can be ranked according to their percentage of the total power, in dB units or watts.

Dynamics Modeling & Simulation

This option uses a Multiple Input Multiple Output (MIMO) dynamics model to calculate Inputs, Outputs, and Transfer functions. Each part of the model can be calculated from the other two.

Transfer functions can be calculated from multiple Input and Output time waveforms. Time domain windowing (Rectangular, Hanning, or Flat Top), linear or peak hold spectrum averaging, triggering, and overlap processing can be applied during Transfer function calculations. Ordinary Coherences are also calculated for single Inputs, and Multiple & Partial Coherences are calculated for multiple Inputs.

Multiple Output time waveforms or frequency spectra can be calculated from Transfer functions and multiple Input time waveforms or frequency spectra, and animated ODS's can be displayed directly from the Outputs. Transfer functions can be derived from experiment or from mode shapes. Inputs can be derived from experiment or synthesized.

Similarly, multiple Input time waveforms or frequency spectra can be calculated from Transfer functions and multiple Output time waveforms or frequency spectra. The Outputs can be derived from experiment or synthesized. This capability can be used for Force Path Analysis.
Structural Dynamics Modification

If a noise or vibration problem is due to the excitation of a resonance, the structure must either be isolated from its excitation sources or physically modified to reduce its vibration response levels. With this option, you can quickly investigate the effects of structural modifications on the modes of a structure. The new modes can then be used in MIMO calculations to determine the effect of structural modifications on overall vibration levels.

SDM models structural modifications using industry-standard FEA elements. The FEA element library includes the same elements used by the Experimental FEA option.

All modification elements are displayed on the 3D structure model. Each element type has its own spreadsheet, where its properties can be viewed and edited.

SDM works with either analytical (FEA) modes or experimental modes of the unmodified structure. Because the new modes of the structure are calculated so quickly, SDM can be used for Modal Sensitivity studies, where thousands of solutions are calculated and ranked for comparison. SDM also includes a special command for adding tuned vibration absorbers to a structure.

Experimental FEA

This option allows you to construct an FEA model of your test structure and solve for its analytical mode shapes. The FEA model is constructed by adding industry standard FEA elements to the same 3D model that is used for displaying experimental shape data. The FEA element library includes springs, masses, dampers, rods (with axial stiffness), bars (with axial, shear, and bending stiffness), triangular and quadrilateral plate elements, and solid elements such as tetrahedra, prisms and bricks. The FEA element library includes the same elements used by the SDM option. This option includes both a normal mode solver for FEA models without damping, and a complex mode solver for FEA models with proportional damping.

By constructing an FEA model and solving for its modes prior to a modal test, this option helps you determine proper transducer and exciter locations for the test. Following the test, you can compare the experimental and FEA mode shapes (both graphically and numerically) to validate your results.

The FEA model can also be used with experimental ODS data from a structure to calculate the ODS for all unmeasured DOFs where the FEA model is defined.
What is MechaniCom?

The MechaniCom Machine Surveillance System is a real-time, fully automated, network-based machine and structure monitoring system.

MechaniCom features include:

- **24/7 monitoring** of multiple machines
- Alert, alarm, abort warning levels for each acquired signal
- **Email** and text message notification when a warning level is exceeded
- **Comparison** of current & baseline operating data
- Gauge for each acquired signal, with green-yellow-orange-red warning levels at each sensor location
- **3D machine model** with green-yellow-orange-red warning levels at each sensor location
- **Animated rotating parts** of the machine model indicate ON/OFF operation
- **Archival storage** of operating data, including time signals, uniform, swept, or octave band frequency spectra
- **Trend plots** of archived data
- **Event Log** displaying warning level crossings and other notable events

Why MechaniCom?

MechaniCom is built around Vibrant’s 20 + years of experience in the design, sales, and support of vibration signal post-processing software, and utilizes ME’scopeVES as its foundation. Designed as a machinery monitoring and preventative maintenance solution, MechaniCom combines all the capabilities of a professional vibration analysis software package with the simplicity of a red light - green light monitoring system. Acquire, process, display, and analyze vibration, temperature, pressure, voltage/current, and flow rate data from your machines any way you’d like, in real-time, 24/7.

MechaniCom can also help avoid costly machine repair downtime with multiple order tracking, allowing for easy early identification of order related machine vibration faults, such as misalignment, unbalance, bent shaft, gear wear, and various bearing faults. By utilizing multiple order tracking in combination with detailed trend plots and baseline comparison, an effective PDM system can be developed, lengthening machine part life and reducing costly downtime.
Many Applications

As wireless technology continues to improve and measurement acquisition hardware and tools become more and more affordable, continuous monitoring and predictive maintenance is finding its way into a wider array of applications than ever before. The MechaniCom Machine Surveillance System can acquire, process, store, compare, and display any type of measured data from a wide variety of industries, including:

- Power Generation
- Petrochemical Production
- Building HVAC
- Structural Health Monitoring
- Assembly / Conveyor Lines
- TeleCom Data Centers
- Plant Machinery Maintenance Services

Plug-n-Play Solution

MechaniCom offers a plug-n-play hardware and software solution package that is uniquely customized to meet your machinery monitoring needs. An intrinsically safe box houses acquisition hardware for the parameters you wish to monitor (vibration, temperature, pressure, voltage/current, flow rate), and wirelessly relays that data to a secure local or remote database for display on any network-capable Windows device.

Designed for permanent installation, the hardware box is rugged, compact, and climate-controlled, allowing for non-invasive placement near the machine while protecting valuable data acquisition equipment.
3D Machine Model for every monitored machine, featuring:

- Color-coded warning level icons at each sensor location
- Animated rotating parts indicating ON/OFF operation
- Display options, including show/hide, transparency, and point labels

Trend Plots of archived data of all types.

- Multiple plot types, including 3D, bar, and point
- Easy data selection and functional overlay
- Quick-select time frame buttons and cursor zoom options

Time and Frequency Trace Display

- Current, Baseline, and Archived traces can be overlayed for easy identification of changes in frequency or magnitude
- Easy identification of multiples of running speed / order related faults, including misalignment, unbalance, gear wear, etc.

Event Log of notable events, including:

- Warning level crossings
- Machine ON/OFF
- Operator notes
Founded in 1991, Vibrant Technology is a leader in developing tools for post-processing vibration and acoustic test data. Vibrant Technology’s software is used by structural testing and machinery maintenance professionals in a wide variety of industries, including:

- Automotive
- Aerospace
- Power Generation
- Paper Mills
- Chemical Plants
- Steel Mills
- Semiconductor Manufacturing
- Sporting Goods Manufacturing
- Construction Equipment