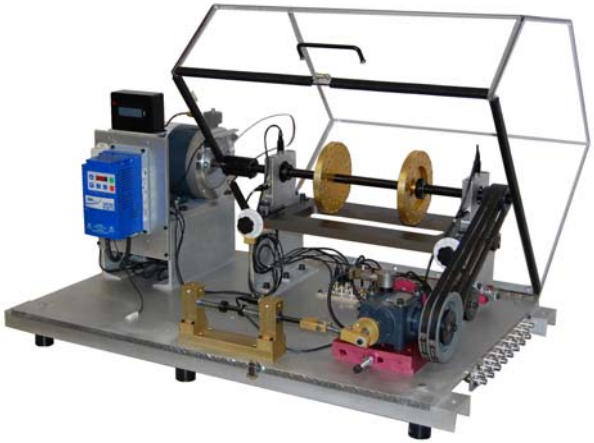
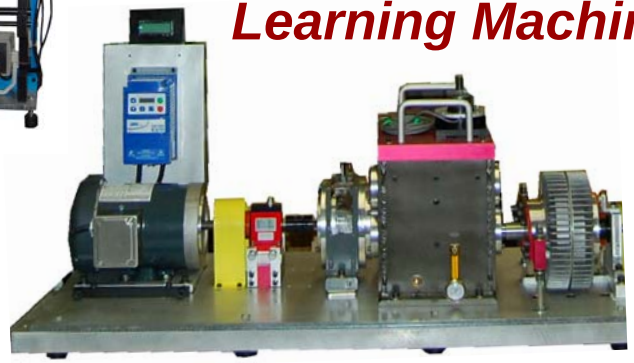
SpectraQuest Product Line



A Complete Line of Simulators for Learning Machinery Diagnosis



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SpectraQuest Product Line

- Simulators
- Data Acquisition
- Software
- Training Packages

A Complete Line of Simulators for Learning Machinery Diagnosis

Features

- Simple methods for introducing controlled, calibrated faults
- Study the vibration spectra of common faults and learn fault signatures
- Bench top machines for hands-on training and sharpening skills
- Learn machine fault diagnosis techniques, machine condition monitoring, and PdM
- Training manuals with exercises for individually paced study
- Learn resonance, variable speed and foundation design issues
- Study correlation between vibration and motor current spectra
- Model rotor dynamics and develop advanced diagnostic techniques

Applications

- Balancing
- Alignment
- Resonance
- Bearing defects
- Rotor dynamics
- Crack shaft defects
- Gearbox faults
- Belt Drive faults
- Reciprocating mechanism
- Mechanical rub
- Induction motors electro-mechanical defects
- Pump and compressor
- Fan noise and vibration
- Drivetrain faults
- Wind Turbine faults

SpectraQuest Simulator Overview

	SAT	BBS	MFS-LT	RDS	MFS	MFS-MG	GDS	DDS	WTDS	DPS	BPS
Balancing		✓	✓	✓	✓	✓					
Alignment	✓		✓	✓	✓	✓					
Resonance			✓	✓	✓	✓					
Bent Shaft		✓	✓	✓	✓	✓					
Rolling Element Bearing		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sleeve Bearing		✓	✓	✓	✓	✓		✓		✓	✓
Damped Rolling Bearing			✓	✓	✓	✓					
Fluid Film Bearing				✓		✓					✓
Oil Whirl and Whip				✓		✓					
Rotor Dynamics				✓		✓					
Crack Shaft			✓	✓	✓	✓					
Fan			✓	✓	✓	✓					
Mechanical Rub			✓	✓	✓	✓					
Belt Drive					✓	✓					
Straight Cut Bevel Gearbox					✓	✓					
Reciprocating Mechanism					✓	✓					
Pump					✓	✓					
Reciprocating Compressor					✓	✓					
Motor Defects					✓	✓		✓			
PC Control		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Parallel Spur Gearbox							✓	✓	✓	✓	
Parallel Helical Gearbox							✓	✓	✓	✓	
Planetary Gearbox								✓	✓	✓	
Prognosis Capable										✓	✓

Bearing Balancing Simulator (BBS)

- Demonstrate and support the study of bearing faults and unbalance under controlled conditions.
- Variable speed machine that can be used to generate each type of fault individually or in combinations, providing a stable platform for study.
- Since bearing related problems are very common, it is essential to have a thorough understanding of the associated fault signatures that occur under a variety of operating conditions.

- A properly balanced machine will save a factory on machine down time, replacement parts, inventory, and energy consumption.
- Provides a basic setup for performing experiments and learning vibration signatures of unbalance and bearings malfunctions.
- Detailed investigation of particular and more advance vibration phenomena require additional attachments and fixtures available through optional kits.

Machinery Fault Simulator (MFS)

- Innovative tool to study the signatures of common machinery faults without compromising production schedule or profits.
- Spacious modular design featuring versatility, operational simplicity, and robustness.
- Each component is machined to high tolerances so it can be operated without conflicting vibration.
- Various faults can be introduced either individually or jointly in a totally controlled environment.

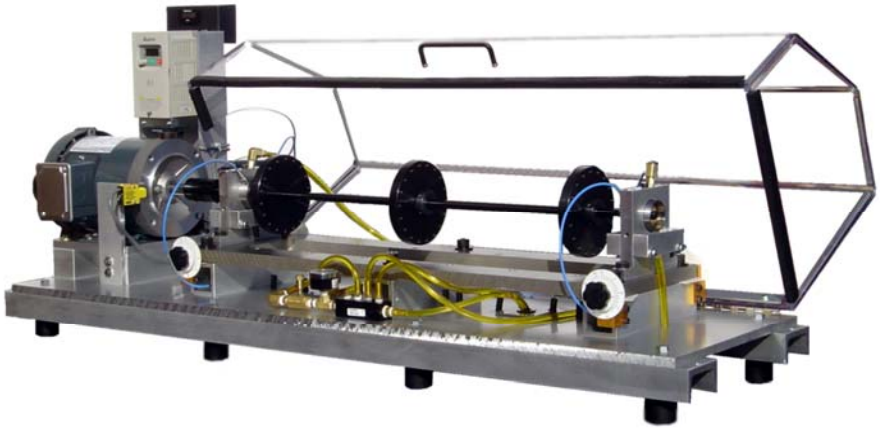
- Provides a basic setup for performing experiments and learning vibration signatures of different machine malfunctions.
- Detailed investigation of particular and more advance vibration phenomena or machinery fault require additional attachments and fixtures available through more than 40 optional kits.

Machinery Fault Simulator Lite (MFS-LT)

- Precision machined simulator, providing the same features and benefits as the MFS, except gearbox, belt drive and reciprocating mechanism. Most of the MFS applications and option kits can be used with the MFS-Lite.
- Portable, robust trainer used to teach vibration signatures of rotating machinery.

Machinery Fault and Rotor Dynamics Simulator (MFS-RDS)

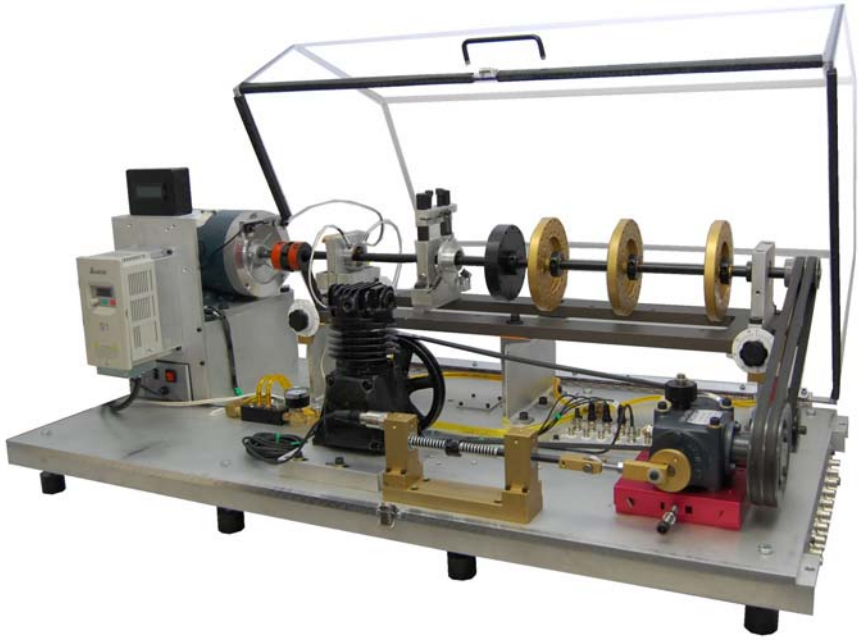
- Innovative tool to study the dynamic behavior for rotor supported by oil lubricated journal bearings, as well as other common machinery faults, such as balancing and resonance study.
- An oil pump is provided with the simulator to drive the lubrication fluid.
- Provides different bearing clearance selection and controllable lubrication oil pressure for rotor dynamics, whirl and whip phenomena.



- Fitted with a resonance kit is the perfect tool to gain practical experience in rotating machinery resonance and learn resonance mitigation methods.
- With different number of rotor disks installed at various locations on the main shaft, resonances up to the third mode can be excited.
- Oil whirl and whip, the important instability phenomena associated with rotors supported fluid film bearings, can be studied

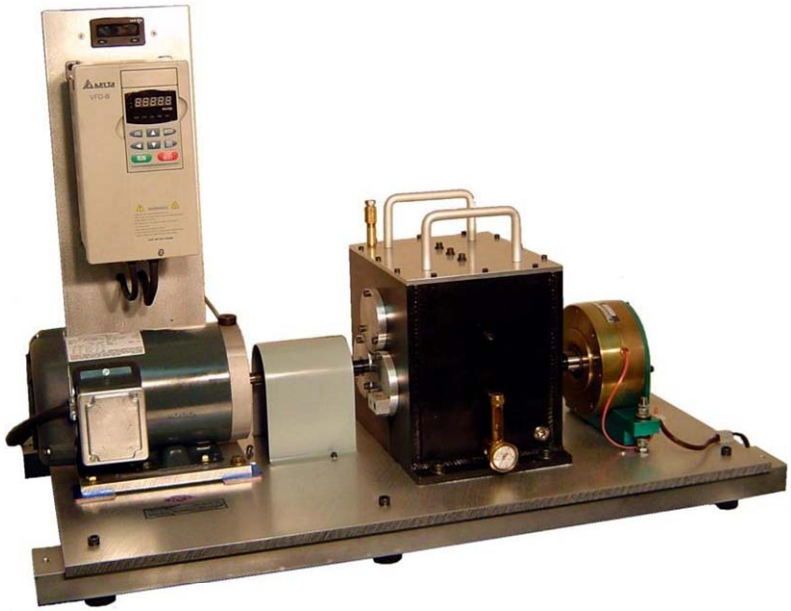
MFS Magnum (MFS-MG)

- Innovative upgrade of the MFS.
- An oil lubricating system allows you to configure the machine using either fluid-film bearings or rolling element bearings.
- Extended shaft length provides more space for overhung rotors, and is more suitable for studies in resonance and fluid-induced instability issues.
- Combines all the capabilities of the MFS and the MFS-RDS, making it the most comprehensive simulator that we offer.



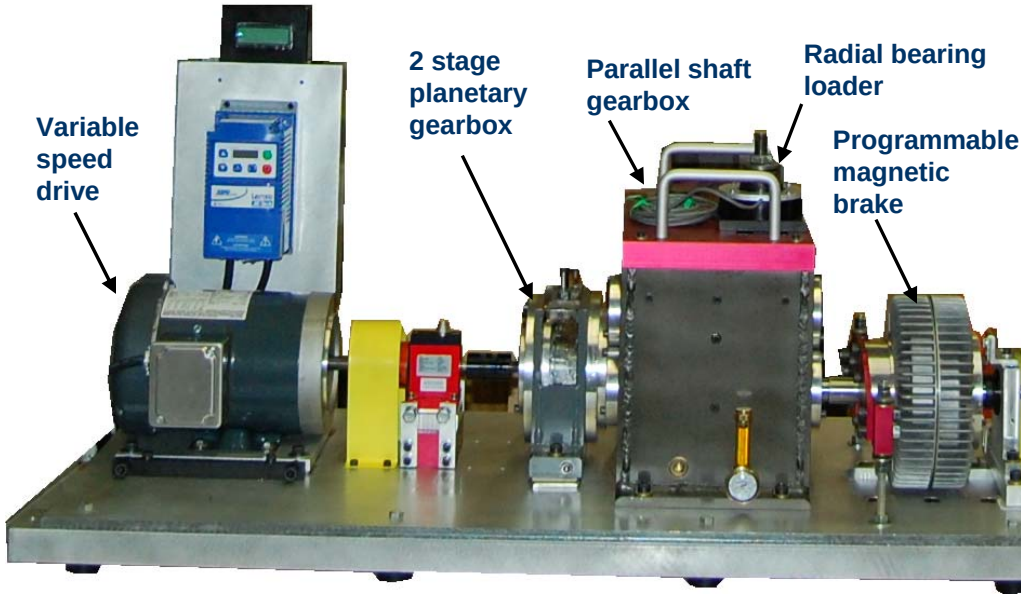
Gearbox Dynamics Simulator (GDS)

- Specifically designed to simulate industrial gearbox for experimental and educational purposes.
- Gearbox consists of a 2 stage parallel shaft gearbox with rolling bearings, and a magnetic brake.
- All elements of the GDS have been designed to investigate gearbox dynamics and acoustic behavior, health monitoring, vibration based diagnostic techniques, lubricant conditioning or wear particle analysis.
- Robust enough to handle heady loads and spacious enough for easy gear placement, setup, and installation of monitoring devices.
- Two-stage parallel shaft gearbox can be configured as to reduce or increase the gear ratio.



Drivetrain Dynamics Simulator (DDS)

- Goes further than GDS to research a complete drivetrain.
- Consists of a 2 stage planetary gearbox, a 2 stage parallel shaft gearbox with rolling or sleeve bearings, a bearing loader, and a programmable heavy duty magnetic brake.
- Planetary gear train, sun, planet and ring gears, the carrier, and bearings are all easily accessible.
- Effect faults like surface wear, crack tooth, chipped tooth and missing tooth can be demonstrated on either spur gears or helical gears.
- Rolling element bearing faults like inner race, outer race, ball damage can also be incorporated.



Wind Turbine Drivetrain Diagnostics Simulator (WTDS)

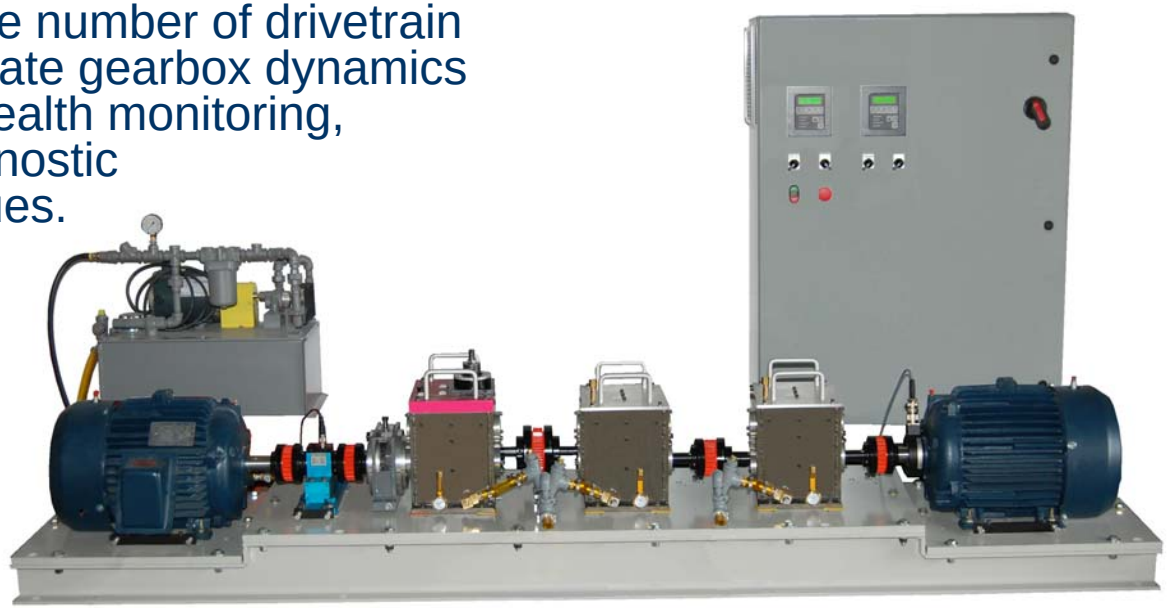
- Simulate wind turbine drivetrains for experimental and educational purposes.
- Consists of a 2 stage planetary gearbox, a 2 stage parallel shaft gearbox with rolling or sleeve bearings, a bearing loader, and a programmable magnetic brake.
- All elements of the WTDS have been designed to maximize the number of drivetrain configurations to investigate gearbox dynamics and acoustic behavior, health monitoring, vibration based diagnostic techniques, lubricant conditioning or wear particle analysis.
- With the programmable magnetic brake, rapid load fluctuation can be applied to simulate real life loading conditions experienced by wind turbines

Bearing Prognostics Simulator (BPS)

- Conduct fundamental research in bearing wear and in modeling bearing damage evolution process.
- The torque transducer is sensitive enough to measure the small frictional torque bearing resistance under several thousand pounds of transverse/axial load.
- Driven in three software selectable modes (1) a constant rotational speed, (2) purely oscillatory motion, and (3) oscillatory excitation superimposed on rotation.
- Experiments can be performed on rolling element bearing, pressurized fluid lubricated bearings, and the grease lubricated bearings.
- The friction torque and the load transducers provide unique data, previously not available, for understanding bearing prognostics signature and modeling bearing failure mechanisms.

Drivetrain Prognostics Simulator (DPS)

- Designed to simulate industrial drivetrains for diagnostics and prognostics research.
- Consists of a two-stage planetary test gearbox and a two-stage parallel shaft test gearbox with rolling or sleeve bearings.
- Two test gearboxes can be arranged to apply the highest torque to either, a torque which is large enough to induce wear and damage in the gears.
- Two-stage parallel shaft gearbox can be configured with a gear ratio from 1 to 6.
- Designed to maximize the number of drivetrain configurations to investigate gearbox dynamics and acoustic behavior, health monitoring, and vibration based diagnostic and prognostics techniques.



Shaft Alignment Trainer (SAT)

- Designed for studying a wide variety of problems that can arise when two shafts are misaligned.
- Hands-on trainer for maintenance professionals.
- Provides a unique mechanism for studying soft and sprung foot.
- Realistic simulator with a one inch diameter shaft that fits standard couplings.
- Available in a two train and in a three train configuration.
- Incorporates two fully adjustable modular units featuring horizontal jack bolts, calibrated and reference dials, and replaceable feet.
- Three train SAT adds a fixed module which simulates a non-adjustable machine, but, the shaft can be offset and axially floated.
- Robust, portable, and simple to use.
- Has ample space to mount dial indicators and laser heads for alignment training.

Custom Designs

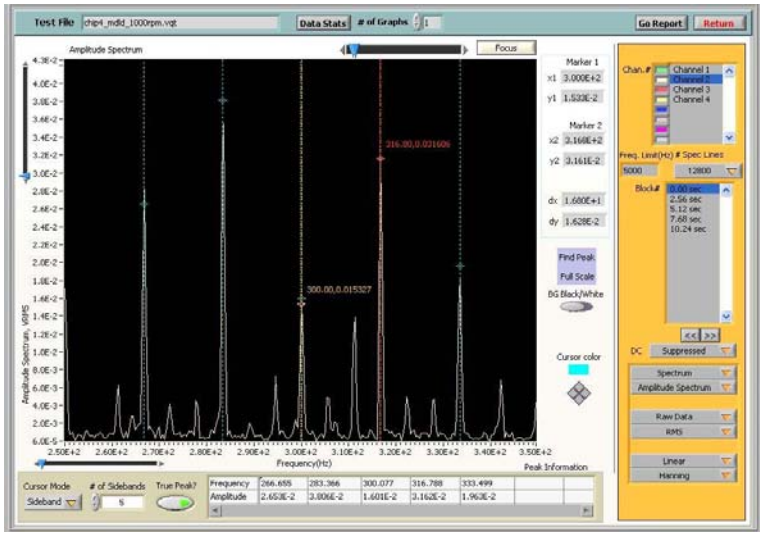
- Long experience in making custom machinery to meet our customers' exact needs.
- From small modifications to our standard simulators to complete custom designs weighting more than ton, we will provide you with the test rig that you need for your research, development, or training requirements.
- If you can't find it, we will make it.

Vibration Fundamentals Training System (VFT)

- A turn-key integrated educational package for teaching/learning the fundamental principles of mechanical vibration as well as engineering mechanics.
- Provides both a comprehensive hands-on experimental device and an instrumentation package for performing laboratory exercises to enhance student understanding of vibration theory.
- Clearly brings classical theory to life by providing a convenient mean to validate predictions and to demonstrate the influence of parameter changes on system response visually.
- Students can perform virtual experiments using the vibration simulation software and then verify the results with actual experiments thereby reinforcing the learning of difficult principles.
- It is an ideal tool for mechanical vibration courses both at under graduate and graduate levels.

VibraQuest

- VibraQuest (VQ) is an integrated solutions package for rotating/reciprocating machinery fault diagnosis, structural dynamics analysis and design, and acoustical analysis. It provides tools to solve noise and vibration problems, from experimental design to solution strategy development.
- VibraQuest comes in two variants:
  - VibraQuest Lite provides all the functions for basic data acquisition and analysis
  - VibraQuest Pro adds impulse data acquisition and additional, more advanced data analysis functions.



VibraQuest Lite

- Multi-channel data acquisition and analysis system.
- Powerful signal processing and data presentations of time waveform, FFT spectrum, and frequency response function.
- Hanning, flat top and Kaiser-Bessel window functions
- Linear, log or dB scale.
- Magnitude, phase, real, or imaginary FRF.
- Two active cursors with delta values.
- Data statistics (mean, median, RMS, deviation, variance, correlation, covariance, etc)
- Two graphs can be used to compare between different files or channels.
- Simple project management, including experimental design with over thirty built-in templates to organize and document testing.
- User defined project and test templates for repetitive experiments.
- Capability to incorporate user-defined non-linear sensor behavior.

VibraQuest Pro Adds

- Impulse and hammer test data acquisition.
- Polar, Bode, Nyquist, orbit and waterfall plots.
- Cross power spectrum, coherence, and impulse response signal analysis.
- Additional window functions (Hamming, Blackman-Harris, exact Blackman, Blackman, 4 term Blackman, 7 term Blackman, force, and exponential).
- Octave analysis, 1 to 1/24 octave, linear, A, B, C weighting.
- Harmonics and sideband cursors.
- Up to eight graphs can be used to compare between different files or channels.
- Digital filtering.
- Multiple user management.
- Data import and export, including ME'scope for modeling and modal analysis.
- Data reporting.

VibraQuest Add-On Modules

For more advance analyses, a choice five modules can be added to VibraQuest Pro.

- Induction Motor Fault Diagnosis
- Rotating Machinery
- Data Streaming
- Transient Analysis
- Order Analysis

Data Acquisition Systems

- SpectraQuest offers a wide range of data acquisition systems: 4 channels to 16 channels, low cost or high accuracy, portable or stationary. Combined with our VibraQuest data acquisition and analysis software, you can have a DAQ complete turnkey solution from one location.
  - 4 Channel Portable USB
  - 8 Channel 5kHz Portable USB
  - 8 or 16 Channel Portable SpectraPad
  - 8 or 16 Channel Desktop DAQ

Software

- AlignmentQuest
  - Dial indicator software for machinery shaft alignment.
- BalanceQuest
  - Comprehensive, user friendly software for balancing common rotating equipment
- Engineering Mechanics
  - Software suite is for learning principles of signal processing, vibration fundamentals, and structural dynamics. Computer simulations, analysis, design and animations visualize theories and expedite learning.
- MEscopeVES
  - Software package designed to make it easier for you to observe and analyze a variety of noise & vibration problems in machinery and structures.
- XLRotor
  - Rotordynamics analysis software ideal for use in the design, maintenance, evaluation and audit of a wide variety of rotating equipment.