

# VibControl

## Applications (Examples)

### University of Illinois Selects New VibPilot for Vibration Control and DSA

The Linear and Nonlinear Dynamics and Vibrations Laboratory at the University of Illinois have selected the m+p international's new multichannel vibration/acoustic controller plus analyzer, the VibPilot. This unique capability of dual use of the new custom designed VibPilot 24-bit frontend includes 2 sources for DAC out and 8 input channels for both vibration control and as a noise and vibration analyzer. The primary use is to perform linear and non-linear dynamics experiments to support current research. Applications include linear and nonlinear vibrations, flutter analysis, joint mechanics, system identification, seismic vulnerability of structures, and passive and active control of structures.



### Combined Acoustic/Vibration Controller Solution

Lockheed Missiles and Fire Control Environmental Laboratory, Grand Prairie, TX utilize a unique m+p solution which meets their requirement for a closed-loop controller for both the vibration and acoustic environments.

Jeff Kirk (shown right), Senior Staff Mechanical Engineer, says: "This is one system that can perform our day to day vibration control work and also meets our needs for a closed-loop acoustic controller operating our reverberant chamber. The common interface reduces my workload and the built-in safety features insures efficient and safe reverberant chamber operation."



This unique solution was developed from the industry leading VibControl solution introduced by m+p international in the 1980's. The powerful customer driven features in the "easiest to use user interface" results in a solution that can scale to meet any requirement, growing with your testing needs. Real-time 1/3 octave closed-loop control for reverberant chambers was developed to meet a special customer need for speed and safety dealing with very expensive test articles in facilities where seconds count and mistakes are not acceptable. Replacing open loop manual control solutions led to more accurate testing, ability to store equalizations and quickly come back to the same condition allowing for equipment and chamber characteristics resulted in repeatable reliable testing. Many safety checks are built in and help the operator protect the test article while helping get the job done more quickly.

Developing this combined solution on a variety of hardware platforms insures customers can take advantage of existing popular hardware such as Hewlett-Packard HP3565, VTI Instruments VT1432B/VT143X as well as the latest addition m+p's 4-16 channel VibPilot.

Lockheed Missiles and Fire Control Environmental Laboratory also take advantage of another m+p solution - the SO Analyzer for portable data acquisition and analysis. The SO Analyzer can also utilize the same hardware as the vibration control and acoustic control solutions as well as the popular National Instruments hardware. Applications include time history recording, sine reduction, modal analysis, operating modal, operating deflection shapes, acoustic intensity and real-time 1/3 octaves, rotating, orbit analysis, pass-by-noise, stepped sine, shock capture and shock response. A perfect complement to the closed-loop acoustic and vibration controller.

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#### Astrium, Europe's No. 1 in Aerospace, Uses 128-Channel System

m+p international recently installed a 128-channel vibration control and data acquisition system at Astrium near Munich which has been our customer for many years. The VibExec system is based on m+p's proven VibControl software and on powerful, highly precise VXIbus measurement hardware made by Bustec. Up to 384 input channels can be integrated into a single 13-slot VXIbus mainframe, with 32 fully differential input channels per VXI slot. All channels are available as control, watchdog and/or measurement channels for vibration testing tasks. VibExec supports all kinds of sine, random and shock tests as well as transient capture applications, e.g. to acquire pyroshocks; all these tests are fully compliant with ISO, DIN, MIL-STD 810 and many other standards. The 24-bit sigma-delta A/D converters featuring a sampling rate of 108 or 216 kSamples/sec per channel provide ICP<sup>®</sup> and voltage signal conditioning as well as TEDS support.



For continuous time domain recording the data is directly stored on two 250 GB hard disks. VibExec records this data at a constant bandwidth which is equal to or higher than the control frequency range. By using the hard disks in a parallel way, there are higher transfer rates possible than those of the single drives - and even with a higher security.

Vibration control and simultaneous gap-free data recording in one system ensure a high test efficiency and minimise the equipment for high-channel count testing.

#### m+p international Provides Ethernet (LXI) Based VibControl/SO Analyzer

m+p international has been awarded a contract to upgrade two VibControl and SO Analyzer systems for vibration data acquisition and analysis applications at Y-12 National Security Complex in Oak Ridge, Tennessee, currently using diskless computer technology.

The initial installation in 2003 proved that data acquisition and analysis could be performed on a system that is booted via the network with all test set-ups and results transmitted in encrypted form and saved on a secure remote central computer.

The upgrade includes the integration and functional operation of the EX2500 gigabit Ethernet slot-0 card and multiple VT1436 102.4kHz sampling, 24-bit digitizers of our measurement hardware partner, VTI Instruments inc., with our VibControl and SO Analyzer software in Y-12's diskless environment. The EX2500 Ethernet card allowed to integrate the system directly to the secure network and increase the performance by easing the workload of the PC workstation.

This application fully benefits from the modular design of the used VXIbus platform: The VibControl vibration data acquisition software and the SO Analyzer software run in parallel on the VXI measuring front-end, thus saving money and space.

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#### New Horizons Mission to Pluto with the Help of m+p international

Since January 2006 NASA's New Horizons, the fastest ever launched spacecraft, has been on its journey to Pluto. Both the full spacecraft and many components were tested by m+p international systems at Johns Hopkins APL in Laurel, Maryland. The systems - a 192-Channel Data Acquisition and Analysis System and a 64-Channel Vibration Control System - also include Modal Acquisition and Analysis, a Remote Analysis Station and distributed Multi-Screen support.

m+p international's 192-channel, VXI-based VibRecorder Data Acquisition and Analysis System offers sophisticated tools for online sine, random and shock data reduction. The data are continuously recorded on two embedded VXI throughput disks of 73 Gbyte each guaranteeing gap-free recording. For online analysis, the data can be replayed from the embedded disks. The VibRunner, m+p international's proven Vibration Control and Analysis System based on VXIbus hardware technology provides all control modes for all 64 input channels including random, sine (both with notching), shock, SRS, sine-on-random and random-on-random. Data analysis tools include extensive data handling and analysis, single and multiple data graphing, custom report formatting as well as seamless integration with Microsoft Office products for test reporting. Functionality will be further enhanced by m+p international's SO Modal Software Package for sophisticated modal acquisition and analysis.

The VibRecorder Data Acquisition and Analysis System and the VibRunner Vibration Controller have the same user interface translating to minimum user training and maximum ease of use. Both are configured with remote networked PC's for test setup and monitoring. The "Multi-Screen" function supports several monitors for online display of large channel counts; each monitor has its own default layout set-up file for easy set-up of high-channel count tests.

#### Valeo: Control of Automotive Components on a Hydraulic Shaker

The automotive industry asks its suppliers more and more to perform tests on their own. To meet this requirement, Valeo Thermique Moteur near Paris - a branch of the Valeo group which ranks among the world's top automotive suppliers and supplies all major vehicle manufacturers - further extended their test facilities.

Valeo Thermique Moteur recently awarded m+p international of Montesson, France, a contract for four VibPilot vibration control systems for testing engine cooling modules on a Schenck long-stroke shaker. The used VibPilot systems enable Sine, Random and Shock testing as well as RoadLoad simulation. In RoadLoad mode, VibPilot replicates the behavior previously measured on the road on the shaker, thus transferring the real conditions a vehicle undergoes during its life to the test laboratory. The vibration control software was optimized to do low-frequency tests with specific profiles.

m+p international is pleased to help Valeo to improve the quality and reliability of its products.

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#### Acoustic Control and Progressive Wave Tube Testing at NASA

NASA Langley Research Center, Hampton/Virigina, has used the m+p international VibControl system for acoustic control at their progressive wave tube test facility for years. Tested spectra include uniform, two cases of pink noise, three cases of narrow-band random, a simulated launch payload bay environment for an expandable launch vehicle, and a simulated external acoustic load for the aft section of a reusable launch vehicle.

#### Time Domain Recording during Vibration Control

m+p international won orders for a total of 144 channels of real-time vibration control and dynamic data recording systems from the European space company EADS Astrium.

Satellite shock and vibration testing is a complex and expensive undertaking and often requires high-channel counts for control and monitoring during the testing. Also because tests can only be run once to avoid overstressing the system, it has been the practice to run two separate systems, one for control and another for data acquisition; tape recorders have also often been used for this in the past. Running two systems means double the channel count to connect up, two operators and difficulty synchronising the two - all factors that mean that recording is not always done hence increasing the risk of losing valuable data.



m+p international's solution is based on their VibControl family of software and the latest VTI Instruments front-ends that have

combined both advanced control and real-time throughput data capture into one system. Both functions operate in parallel with data recording operating seamlessly in the background. Only one set of sensor channels needs to be instrumented hence saving time and greatly simplifying the set-up and operation. The recorded time sample data can be post-processed to refine the real-time frequency analysis produced during the test or can be analysed directly in the time domain using the m+p SO Analyzer software suite to do transient and cross-channel event correlation, e.g. to determine event sequences that led to failure.

Because recording the data to disc does not affect real-time control performance this also means that raw time sample data recording can be a routine operation thus providing that extra security backup and improved feedback on all tests without the added costs. The VibControl system is capable of all vibration test modes and the front-end has up to 102 kS/s sampling frequency per channel with direct recording to SCSI disc drives and has 24 bit ADC resolution with 130 dB dynamic range.

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#### Light Bulb Testing at Volkswagen

For many years m+p international has already been a successful supplier of environmental test and process monitoring solutions for several Volkswagen facilities. Our services range from planning, implementation and installation to full-operational support.

At Volkswagen headquarters in Wolfsburg/Germany, m+p is in charge of the light bulb test stand: 100 lamps are checked in parallel for their service life in permanent and in blinking operation. The complete lamp test also includes luminous flux measurements and a 20-hour-vibration test using our VibControl shaker controller. Only if the lamps pass these comprehensive tests and meet the Volkswagen requirements, they will be released and can be mounted into the vehicle.



#### Advanced Vibration Testing of Sub-Satellite System

The EADS Astrium test centre near Munich has been working with m+p international vibration control systems for many years. For instance, the test engineers used the VibExec controller for the vibration qualification test of a solar panel which is part of the ROCSAT-2 earth observation satellite. The final qualification and quasi-static testing of the panel required 108 input channels of which 48 were dynamic strain, 18 force sensors and the others were accelerometers. The VibExec vibration controller was tasked with running two critical one-off tests and collecting real-time data from all channels for post-test validation analysis.

#### m+p international Wins Army Contract

The U.S. Army in Fort Huachuca, Arizona awarded m+p international of Verona, New Jersey a contract for four VibRunner Vibration Control and Data Analysis Systems to be utilized by EPG Testing Group. The contract requires complete automatic control of four existing climatic chambers via LAN with or without vibration simulation.

The VibRunner, m+p international's mid-range vibration control and analysis system based on VTI Instruments VXIbus hardware technology and Windows XP operating system, will provide all control modes including Random, Sine (both with notching), Shock, SRS, Sine-on-Random, and Random-on-Random. Data Analysis tools include m+p international's SO Analyzer for multi-channel DSA, structural analysis, rotating machinery analysis, acoustic analysis, and vibration control analysis, with the SO Analyzer e-Reporter guaranteeing seamless integration with Microsoft Office products for test reporting. The VibRunner is configured with m+p international's Chamber Control and Interface software for complete set-up and control of the climatic environment.