Road load simulation

A quick and simple way of getting closer to real-life component loading effects is to adopt road load simulation

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Rather than using a standard signal type such as random, sine or shock, with road load simulation any arbitrary waveform recorded from the test track can be reproduced on the shaker table.

This technique is as much as home on an electrodynamic shaker as it is on a hydraulic system. Applications include durability testing of car radio, ECU, light unit, seatbelt, truck brake, radiator, and F1 racing.

Transferring data from the true environment to the test lab to simulate the product's environment can be daunting. The m+p VibControl suite of programs provides unlimited time data replication with real-time control.

The VibControl road load simulation software has two very important steps. First is the ultra-flexible editor, which enables the import of almost any raw-data signal, including RPC3, WAV and ASCII, that can then be viewed in acceleration, velocity, displacement, or spectra graphs. Single-point editing or signal clipping, band-pass filtering, and signal length selection are all valuable tools included in the editor. The most important fact, of course, is the ability to deal with very large sample files, and any sample frequency.

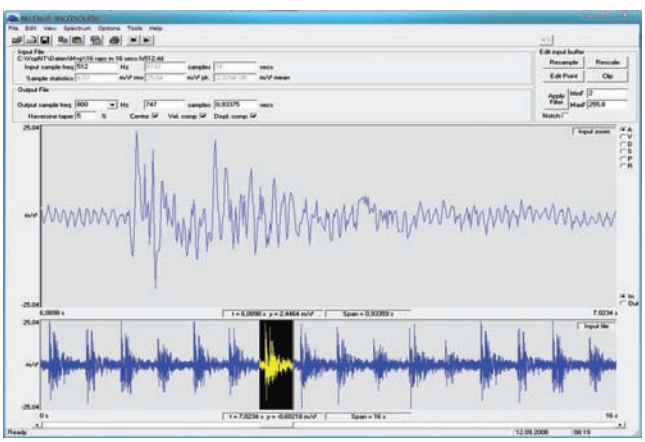
The second step is the test phase. Using highly advanced, continuous update control loops and the intuitive VibControl user interface, control is set up simply and applied with speed and finesse. A single file can be repeated without gaps any number of times to build up required test times.

The development of real-time continuously updating control is a great improvement in test repeatability and quality. The ability to control, in real time, a signal that is constantly changing and can last for hours requires a very stable control algorithm.

The coherence averaging technique used in VibControl is stable and provides reliable long-term control. Utilizing this stability ensures the accuracy of the replicated signal is at its peak throughout the test, and ensures fast reaction to dynamic changes on the shaker.

Upon test completion, the measured data can be viewed using an unmatched range of reporting tools that will automatically filter data types, embed company logos, use predetermined report layouts and, if required, the engineer can send the data to customers in ActiveX format.

The real power of road load simulation on a shaker is in the pre-test data handling. The test engineer is, at all times, faced with a need to provide a balance between test requirements and the limitations of the physical equipment. The compilation of sample data enables the engineer to tailor the raw data to meet equipment limitations and to develop a time history that includes all sections of the signal that are of interest.



LEFT: Transferring data from the real world to the test lab can be daunting
BELOW: VibControl screenshot

The copy-save-append function of the VibControl simulation software means that relevant sections can be put together. Areas of low vibration output, which are of no interest, can be removed from the final time history, minimizing valuable test time requirements.

Where many road surfaces are combined in complex sequences for long-term durability testing, VibControl can easily combine individual tests in any complexity of nested loops.

If the test is left unattended for an overnight or weekend run, the test engineer can still be in control. The communication interface can be set to send an email upon test completion or abort, and this email can easily be forwarded via an SMS text message to a cell phone.

The road load simulation software is fully compatible with other vibration test modes, such as random, sine, shock, SRS and mixed mode.