RANDOM VIBRATION TESTING of PACKAGED-PRODUCTS
Considerations for Methodology Improvement (Written 2008)

ABSTRACT

In the early 1980's, random vibration became practical in packaging laboratories, and tests based on Power Spectral Density (PSD) measurements and control have since become the norm. Random vibration motion produced in the laboratory can be very similar to the motion of actual transport, and often there is good correlation between lab results and "real world" experience. Test protocols based on this technology are published by ISO, ASTM International, ISTA, and many other national and international organizations.

In the last few years, however, it has become recognized that the standard random vibration approach could potentially be improved. Because a single PSD typically represents an average taken over a relatively long time interval, it can omit, or "average out", varying amplitudes, differing vibration features, and infrequently-occurring but nonetheless significant and potentially damaging motions. Visualize a section of rough road or a rail crossing in an otherwise long, smooth truck shipment. Or a relatively brief period of turbulence or a bad landing in an otherwise long, smooth air journey. There is legitimate concern that the submersion of these changing conditions and large events into an overall average may significantly compromise the simulation value of the resultant test.

A number of proposals have been made and test approaches undertaken to address this issue, including creating and running both high-intensity and low-intensity spectra, control of kurtosis and use of non-Gaussian vibrations, synthesis of non-stationary random processes, shock-on-random, and more. However at this point there is no consensus regarding the best methodology.
This paper will describe the issue in detail, and summarize the various suggested approaches in simple terms. Recommendations regarding practical approaches, further research, and possible industry consensus will be made.