EDITORIAL

Forty Years of *Sound and Vibration* Magazine

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In 1966, five years after the demise of *Noise Control* magazine, I began to discuss with my associates the need for a technical journal that would publish articles on the application of new technology in the field of noise and vibration control. Unknown to me was the fact that Jack Mowry, then an applications engineer for B&K Instruments, had the same idea. B&K Instruments, Inc. was then the U.S. distributor for Brüel & Kjær dynamic measurement instrumentation.

Early that year he called me, and without telling me any details, asked if he could pay me a visit. At that meeting he told me of his plans for a new business-to-business publication that would cover the fields of noise and vibration control. I outlined my thoughts on the subject, and we discussed the various potential audiences for such a publication. Before we were through, Jack asked whether I would be interested in being the editor. After consultation with my firm's senior staff, I agreed. Jack had indicated that he wanted to be publisher but not editor. I indicated that I wanted to be editor but not publisher, so it was a perfect match.

From there on, Jack and I busied ourselves with obtaining mailing lists, papers, advertisers, news items, and new product announcements. The result has been 40 years of continuous publication of this informative magazine, including more than a thousand interesting articles, hundreds of technical briefs, news of the field, thousands of advertisements, and of course Eric Ungar's whimsical A-to-Z rhymes.

I continued as editor of S&V for the next five years through February 1971. Then there were a series of editors and Jack Mowry took over as both editor and publisher in August 1974. He has worn both hats ever since. George Fox Lang joined him as associate editor in January 1988 and the S&V masthead has listed a long string of distinguished contributing editors for decades.

During the past 40 years, there have been many changes in the field, with instrumentation moving from discrete components to miniaturized devices based on integrated circuitry. Computers used for data analysis have shrunk from the size of a rack that contained decks of hard drives, boxes of magnetic core memory, and a processor to hand-held devices that contain FFT analyzers, octave- and 1/3-octave band filters, and processors that yield statistical distributions of sound levels. Sound level meters have shrunk to the size of a pack of cigarettes from suitcase-size boxes half filled with batteries. Data loggers, formerly unwieldy boxes filled with electromechanical counters yielding A-weighted statistics in two- and three-decibel increments, are now the size of a small paperback book that provide statistical sound level data in one-tenth decibel increments along with a histogram. Airport noise monitors yield a wide range of noise statistics and can automatically integrate radar data and flight information in their reports. In the area of sound intensity measurement, where formerly no commercial equipment was available, relatively simple, easy-to-use, commercial, two-microphone systems are available today. Today many acoustical instruments have processors as powerful as a laptop computer, and there is software available that permits PCs to simulate a variety of sound and vibration instruments. Also many instruments can be interfaced with PCs using the ubiquitous RS-232 and USB interfaces.

Along with these changes in instrumentation, noise modeling for industrial and community noise impact analysis has advanced from slow, mainframe-generated contours to software packages that work interactively on a laptop. These systems offer instant response to changes in source conditions, elevation, barrier location, and other parameters. Also, they map sound levels by color bands in any desired increment.

Other areas where the speed and programmability of microprocessors have enabled a wide variety of software and hardware applications include, to name only a few:

- Modal analysis
- Noise cancellation systems
- Statistical energy analysis
- Finite-element analysis
- Automobile noise control
- Spectral waterfall plots
- Integrated-circuit piezoelectric accelerometers

Not all of our noise and vibration problems have been so easily resolved. There are unresolved problems in the areas of architectural acoustics and of human response in terms of what we now measure. Today we measure the sound isolating capability of a building partition by constructing a sample of the partition in the opening between two large laboratory rooms. We then generate high-level noise in one room and determine the ratio expressed in decibels of the power applied to the partition to the power transmitted, in each of a subset of the ANSI-preferred, 1/3-octave bands. This is essentially the same method used in the 1920s, and it depends on having diffuse sound fields in both rooms throughout the frequency range of interest. The result is a table of sound transmission loss values.

The labs are large enough that there are an adequate number of modes in the lowest frequency band of interest. But these data do not permit the prediction of the low-frequency sound isolation that will occur in small rooms the size of a typical office or bedroom. Further, use of a rating scheme that relates the partition's effectiveness in isolating human speech, the sound transmission class (STC) has become common.

Unfortunately, people who live in modern townhouses and apartments have large-screen TVs with large loudspeakers that have good low-frequency response. Some may even have home-theater equipment capable of reproducing the TV sound and a wide variety of recorded media having very low frequency content. The result is that high-level, wide-band audio is often generated close to the floor or to a demising wall. With no reliable data for small rooms at low frequencies, we are not in a position to design suitable floor-ceiling systems and demising walls to provide adequate sound isolation. A similar problem exists with respect to impact isolation from children running and adults walking shod or barefoot on structurally sound but very flexible floor-ceiling structures. The only reliable tests available to builders and developers is construction of a mock-up of three adjacent rooms that can be tested with live people and home-theater equipment under real-life conditions.

Another interesting situation in architectural acoustics is where acoustical test data are acquired in 1/3-octave bands, but the results are only published as single-number ratings that are no longer relevant. Similarly, sound absorption, sound insertion loss, and HVAC source data are acquired in 1/3-octave bands but are usually published for six or seven octave-band center frequencies. This does not give the architect and mechanical engineer adequate information to design quiet, comfortable buildings. Some possible solutions to the problem might be generated if the acoustical engineering and research communities were to study the behavior of low-frequency sound in small rooms, find a new sound isolation rating scheme, and present data to the public over the entire frequency range of interest.

A large segment of the public – purchasers of high-end audio equipment – already deal with frequency response curves and narrow-band equalizers, so spectral data is not a new idea.

One more area where we do not have adequate information is in the area of community response to noise. Back in the early 1950s, the Composite Noise Rating (CNR) allowed matching of a noise spectrum to a noise-rating contour and provided some adjustments for time of day, season, and quality of the noise. Use of the spectra were essentially abandoned with EPA's adoption of the A-weighted sound level as the metric and acceptance of the Schultz curve as the predictor of community response. These changes have led to where we are unable to predict with reasonable probability the expected community response to noise. The current method almost works for transportation noise, but efforts to tweak it have not been successful. The method works poorly for industrial and commercial sites – noises from orbital crushers, truck refrigeration units, and rooftop condensing units, for example.

The CNR has been criticized because it had been developed using too small a data base. It seems to me that a move in the right direction would be to return to the concept of the CNR and using the currently large databases of industrial and consulting firms to develop a revised CNR.

One final thought concerning noise assessment: I wonder why we are still using A-weighted sound level in the 21st century. There is already an ANSI standard method for computing loudness. It appears that it is the commitment to history – the decibel – that forces municipal officials, architects, planners, and engineers to deal with decibels, a unit that has no physical or sensory meaning. Current technology permits conversion of narrow-band measurements directly into loudness and loudness level in a handheld meter.

Congratulations S&V for documenting the exciting growth in our ability to measure and control noise and vibration over the past 40 years. SV

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