EDITORIAL

One Test Engineer's Journey – From Test to Simulation and Back Again

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Test and simulation – are there two more provocative methodologies in noise and vibration engineering than these? For years, test and simulation have been like two quarreling siblings in our small corner of the engineering discipline. Each has their own friends, opponents, and traits that make them very much like two siblings trying to find their place in the modern world. But do they really have to quarrel? Can they not live in peace and harmony? More importantly, are we, as intelligent engineering professionals, ready to broker that reconciliation that could come from a happy relationship between these two? This is a story of my own career and the answers I have come to regarding these questions.

For the last 12 years, I have been a die-hard test guy. FFT analysis, order tracking, ODS, sound power, intensity mapping and waterfall plots were the things I lived and breathed. Big anechoic chambers, sooty dyno cells and cramped control rooms are where I have spent my time testing products. During that first part of my career I visited and worked with literally thousands of engineers and extolled the virtues of proper test methods and how they can help solve sound and vibration issues. I never once looked at how simulation technologies were growing or how they could help a test engineer. So I never mentioned how simulation could be useful in solving those problems.

In the past few years, I have slowly come to realize that there is a point where test cannot solve every problem; and more importantly, engineers I work with have been asking if there are alternatives to just test-only evaluations. While testing is still the primary way many of us resolve noise and vibration issues, it is expensive, time consuming and cumbersome. How many times have you spent days or weeks preparing for a battery of tests (having all the physical devices ready, making sure manpower is scheduled, ensuring the test facility is booked, creating a test matrix and procedure to follow) only to take 2 minutes of test data? From there how much time do you spend looking at the results trying to discern where the problem exists and how to best solve it? And when you come to a conclusion, how much time do you spend formatting the data into a report that you can present to your manager, customer, or vendor in a way that makes sense to them?

The answer for many of you will be "too much." But testing is what it is – expensive, time consuming, and requires a lot of company resources. And for many of us, testing is the way to solve problems, because that is how problems have been solved for decades in our field. Grab an FFT analyzer or a sound-level meter and go out to test a product. This is why I asked the question: is their a smarter way to solve NVH problems? This is why I embarked on a new road in my career and decided it was time to learn about simulation.

So with the full gusto I had years ago when I learned NVH testing, I am now jumping feet first into the world of simulation. Now I am not here to say that I am a simulation guru at this point in my career, and I still view simulation through the skeptical eyes of a dyed-in-the-wool test guy. But as I start going down the path of learning simulation technology, I do see that it is a methodology whose time has really come. Today's computing power and advancements in simulation algorithms allow you to simulate what effect damping materials or physical changes would have on the overall sound power levels, radiation paths, structural vibration and operator ear exposure levels of a device under test. On top of that, software manufacturers have made strides in creating user-friendly environments where test guys like me can actually run these simulations without needing a huge time investment to learn how to actually run these software packages.

In many ways, this was a bit of an epiphany moment for me, because I realized that simulation is truly a tool that can be used by an everyday skilled test engineer to solve noise and vibration problems. With that said, I do believe that the promises simulation made in the mid 1990s of being faster, more efficient, and cost effective than test are starting to be fulfilled. In effect, I have sampled the Kool-Aid® and see the value of simulation.

But I temper that with my many years of test experience and knowledge. Can simulation really usurp testing? Absolutely not. Simulation is just a tool in a toolbox, just as testing is. As a home owner, for instance, I find that a screwdriver is a valuable tool that fixes a lot of problems at my house. But a screwdriver does not fix every problem. Therefore, I need a toolbox with a hammer, saw, drill, and of course duct tape (I am a guy after all). That analogy is the same for test and simulation, they are both tools in your toolbox as noise and vibration engineers. You need both to effectively solve problems, and either on its own won't do everything. As a test engineer, I have come to realize that after years of only having testing in my toolbox, I relied 100% on that tool for all the answers, because I just didn't know any better.

The moral of my story is just this: I have learned that it is time for test engineers to re-evaluate simulation technology and its place in the noise and vibration test world. Testing will always be part of our corner of engineering, but simulation is now ready to become mainstream and should be welcomed to the noise and vibration field as another tool that can solve problems, just as modal analysis was in the 1970s, sound intensity in the 1980s, and multi-channel PC-based signal analyzers in the 1990s. Simulation is the tool that can redefine noise and vibration engineering now in the first decade of the new millennium, and we should all work to understand its place alongside testing. As one seasoned noise and vibration test engineer to another, I say "give simulation a second chance." It really has come of age for our field and has a place next to your FFT analyzer. I promise you won't have to put your FFT analyzer in the corner for punishment like I do routinely with my two boys when they don't get along. S/V

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