

## Can You Handle the Information?

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In the digital age, information on all topics, including those that are the purview of S&V, is growing at an exponential rate. But our ability to assimilate, categorize and evaluate that information seems to be regressing as attention spans shrink and our patience withers. We are both the beneficiaries and victims of our new age, and as we approach a new year, I thought I would spend time sharing my observations on the topic.

In 2010, various professional organizations hosted at least 25 conferences on sound and vibration. I personally attended five, though I was invited to as many as 15 events internationally. Assuming the average conference consisted of 400 papers per conference, with a range of 100 to about 900 papers, I estimate that at least 10,000 papers were presented in 2010. In addition, about 30 journals publish papers on various aspects of sound and vibration, generating an additional 2,500 articles. Just for fun, I searched the internet for noise and vibration papers in 2010 and allowed myself only a moment to obtain data and draw a conclusion. I received about 300,000 hits; let us assume that only 10% of these hits are even relevant. The sheer number of papers, and information contained therein, are simply confusing researchers and practitioners with different thinking.

Curious students are often discouraged and believe that every topic has been well researched, leading to little ways of new thinking. In some ways, this reminds me of a line from English poet Samuel Taylor Coleridge's *Rime of the Ancient Mariner*: "Water, water, everywhere, Nor any drop to drink."

Recently I gave a short talk on three brake noise and vibration problems (squeal, judder and moan). As part of our research, we counted the number of conference and journal papers that have been published in the past five decades on the same topic. Though the article count is increasing, especially on the squeal problem, the underlying cause-effect relationships and phenomenological concepts remain elusive or poorly understood. In fact, one of my students remarked that fairly soon we will have infinite (inverse of epsilon) papers while having epsilon knowledge of an important friction-induced vibration and noise issue. That is not to say that we have not made progress on each topic; rather, the application of modern methods (including finite-element and multibody dynamics techniques) has made it easier to

generate extensive results, colorful plots, and thus prepare a paper based on rather specific cases with many simplifications. Still one should not confuse knowledge with information.

Students tend to search only the internet for papers. Books and library visits are not even a part of their research. We cannot seem to "see the forest," since we are not carefully reading and understanding the information. As a consequence, critical thinking skills seem to be diminishing. Some students simply cut and paste the summaries of literature instead of original, critical analysis. I frequently receive e-mail from researchers globally seeking a spoon-fed explanation of papers I've written. They are hoping to receive the CliffNotes version of a particular journal paper without reading the paper in its entirety.

The situation may be worse in some industries, where reading of scientific articles is nearly forbidden; some treat reading as an old-fashioned and out-of-date trait. Recently, one European company asked me several questions on an expensive vibration control device, because management wanted to decide while weighing technical issues versus the cost. I collected several key papers, including my own, where the concepts and applications were well described and applicable. The NVH engineers and designers instead asked me to come to their R&D office and give them a short tutorial. I gave a two-hour lecture, and they admitted that the principle was rather straightforward and that they should have grasped it by reading the published papers. *But* they just did not have the time to read. They are too busy running tests, firefighting, cutting costs, chasing parts and making game plans for management than to focus on what is necessary. I see this happening.

Am I the only one worrying about this? No . . . I have started to notice that several recent articles and books have touched this subject. For instance, a story titled "Digital Devices Deprive Brain of Needed Downtime," (August 31, 2010, *New York Times*) also discusses the perils. The story claims, "a barrage of information leaves people fatigued." Yet others claim that the Internet itself has caused harm in the sense that we think and reflect less, expecting to have all information to be summarized at our fingertips.

This is also evidenced by Nicholas Carr in his recent book – *The Shallows: What the Internet Is Doing to Our Brains*. I suspect that this issue will get more traction as we

move into the future and younger generations rely more on electronic data sources rather than printed materials and the old-fashioned testing of theories.

Let me get back to the subjects covered by S&V and stop worrying about the world. What can we do to ensure that we generate wisdom and use that to solve noise and vibration control problems and develop good, quieter and durable products for society? Here are some ideas that even I might follow:

Encourage authors to write papers that survey the field and digest the vast quantity of information into easy-to-read, intelligible papers for the benefit of our community. (Perhaps S&V readers can take the lead in this area and suggest topics for potential authors.)

Encourage authors to write papers on their failures. For example, discuss the methods or designs that did not work though they sounded very appealing at the outset. Learning from failures teaches more than learning from successes.

Conferences should organize more panel discussions and interactive workshops where we can discuss what we know and do not know. Such sessions could reduce the number of slots where authors present their success stories and unique methods. (This might reduce attendance or revenue-generating registrations at some conferences, but users of information might benefit more.)

Dedicate time where you shut down your smart phones and laptops; instead read something (say one section in a classic text such as Rayleigh's *Theory of Sound* or J. P. Den Hartog's *Mechanical Vibrations*). Or, just think or contemplate. (I am not suggesting that you begin to take short naps while pretending to work.)

Reduce the number of papers you plan to read. Instead, just focus on (and read them carefully) five relevant articles that should teach you what you need to know.

Involve young people in your work or participate in an outreach program and share your wisdom. Use your practical knowledge of various aspects of sound and vibration to relate to students, since they are usually fascinated by loud music and a need for speed. It can be a learning experience for both.

I think that I am already getting fatigued by this line of thinking. Let me get back to the comfortable world of my BlackBerry and Internet, and get my daily dosage. **SV**

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