With Abaqus FEA software from SIMULIA, GN ReSound can simulate the realistic behavior of its hearing aid devices thus improving hearing aid performance while shortening development time.

By **Dora Lainé**

GN ReSound Uses SIMULIA to Optimize Product Performance

The rate of hearing loss in the global population is estimated at between 1.5 and 5 percent, depending on the definition of "deafness." Total lack of hearing is actually rare, but when hearing loss occurs within the normal frequencies of human speech, it can create significant challenges at any age. Most cases of hearing loss can be improved with externally worn, behind-the-ear (BTE) hearing aids. But designing high-tech hearing aids that are light, comfortable and stylish can be a challenge for BTE hearing aid design engineers.

HEARING AID SPECIALISTS

The GN ReSound Group is one of the world's largest providers of hearing instruments and diagnostic audiological instrumentation. GN ReSound engineers perform design analysis and testing in a high-tech acoustics laboratory at the company's corporate headquarters in Copenhagen, Denmark. Just a few years ago, hearing aid prototypes were physically tested in the lab, and modifications in their design and composition were made according to the results. But now GN ReSound uses Abaqus FEA software from SIMULIA to test its designs thus reducing the number of prototypes needed and significantly shortening development time.

FINITE ELEMENT ANALYSIS FOR ACCURATE RESULTS

"Before simulation, we were limited to a trial-and-error approach for all our hearing aid design and testing," says Morten Birkmose Sondergaard, Senior Acoustic Engineer at GN ReSound. "With Abaqus we can accurately evaluate and alter the behavior of a hearing aid in the early design stages making the device more stable and improving its performance."

MODELING THE HEARING AID

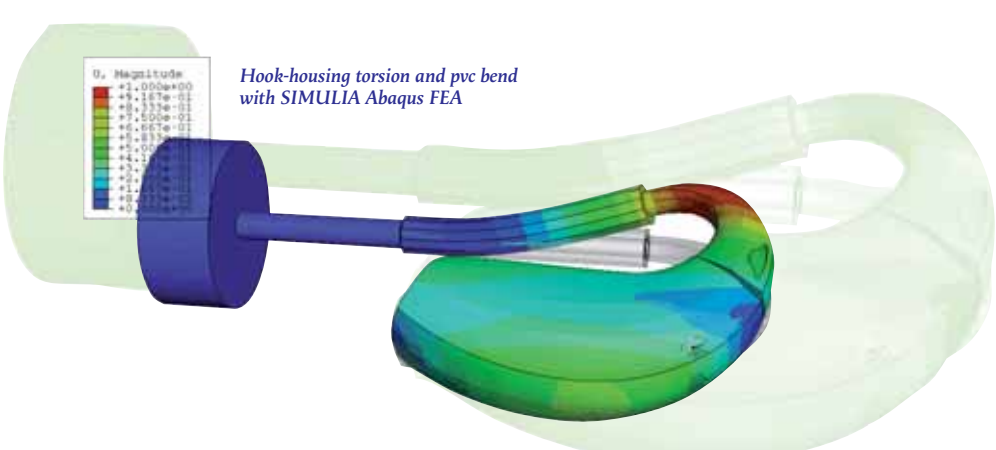
Abaqus software enables GN ReSound engineers to make computer models of all the critical elements of a hearing aid. They run their models through virtual vibration and sound pressure stresses that approximate real-world conditions, assess performance, and then validate the results with laboratory tests of actual units.

Within Abaqus, models of critical connections, such as that between the steel receiver housing and the rubber tube that goes over the receiver sound port, are a particular focus for simulation. Abaqus' "shrink-fit" function is used to model the important pre-tension in the part of the rubber tube that stretches over the underlying receiver sound port. Acoustic resonance frequencies are also studied using an FEA modal analysis, which incorporates both natural vibration frequencies and the specific vibration patterns of the structure being studied. And with Abaqus' multiphysics capabilities, engineers can analyze the air that conducts the sound as well as the interaction between the air and the unit itself.

VIRTUAL TESTS VALIDATE REAL-WORLD RESULTS

Virtual test data and real-world results are in close agreement. Consequently, materials and components can easily be adjusted to produce a device that provides maximum sound with no "squeal"."We now have a greater understanding of what causes instability so we can eliminate these causes in the early design stages," says Sondergaard. "Thanks to SIMULIA we can optimize designs for all our hearing instrument products" •

For more information:
www.gnresound.com



Hook-housing torsion and pvc bend with SIMULIA Abaqus FEA