

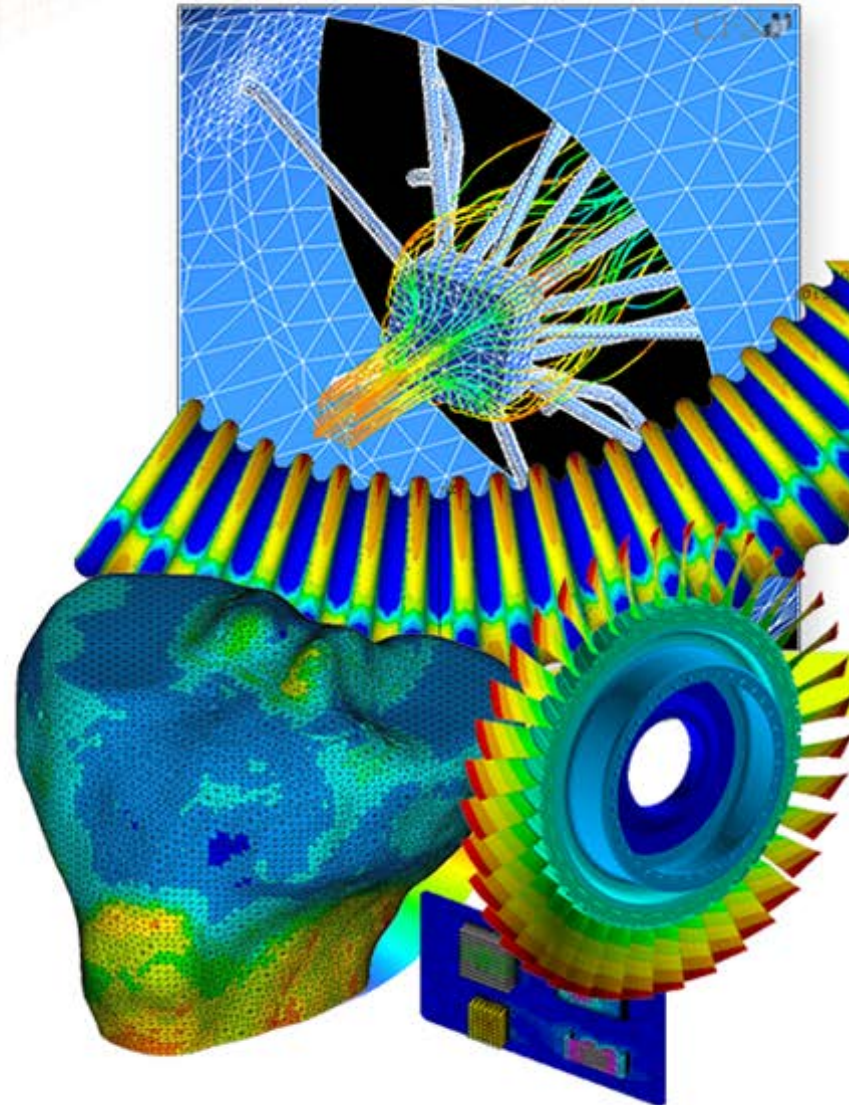
CAE Associates ANSYS e-
Learning Series

Workbench Acoustics ACT

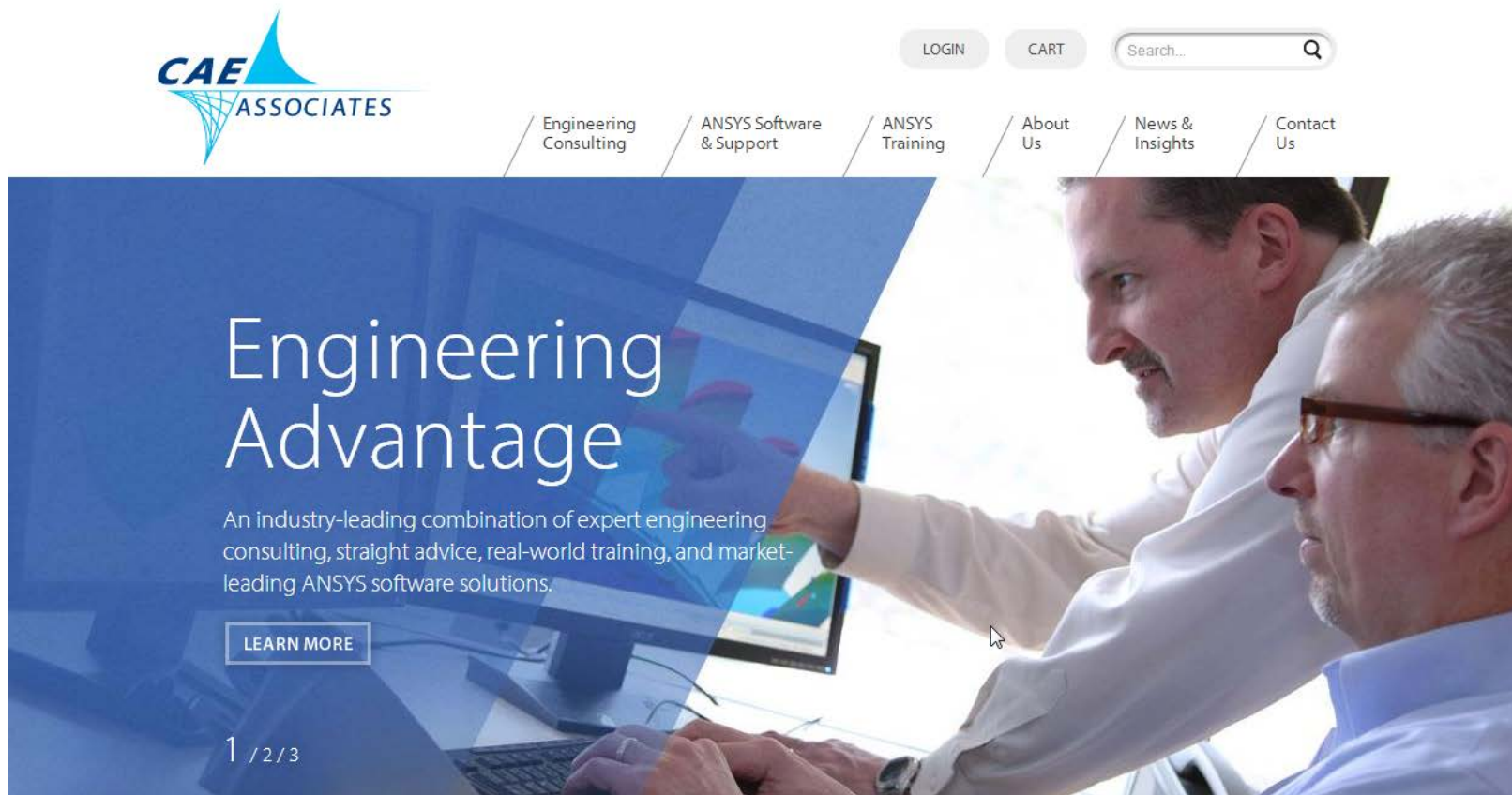
Steve Hale

Senior Engineering Manager

CAE Associates, Inc.



- Engineering Consulting Firm in Middlebury, CT specializing in FEA and CFD analysis.
- ANSYS Channel Partner since 1985.



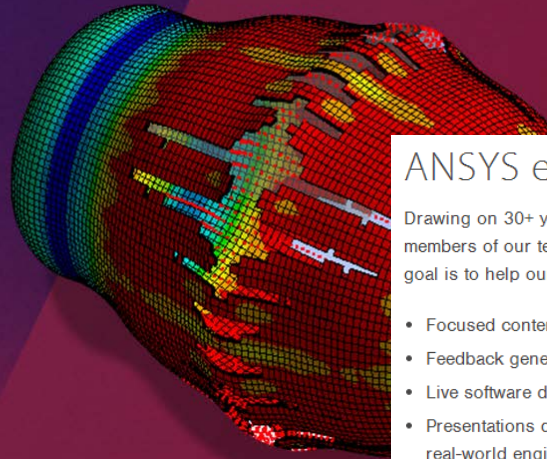
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- Focused content based on usability.
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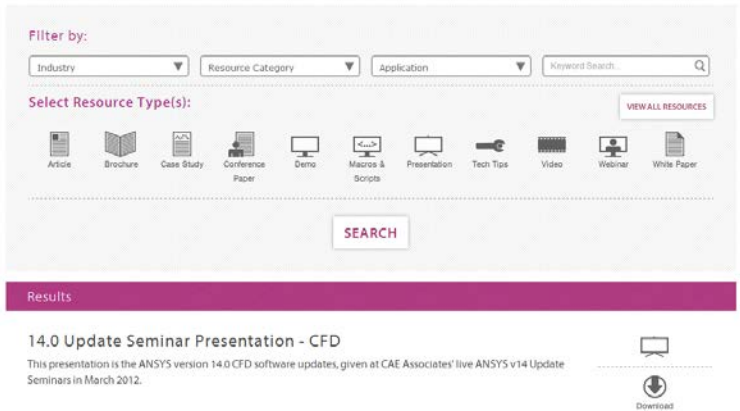
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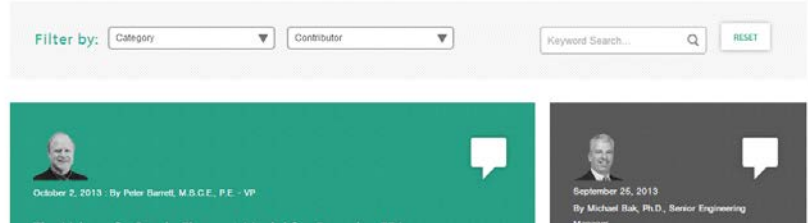
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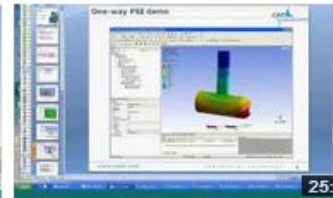
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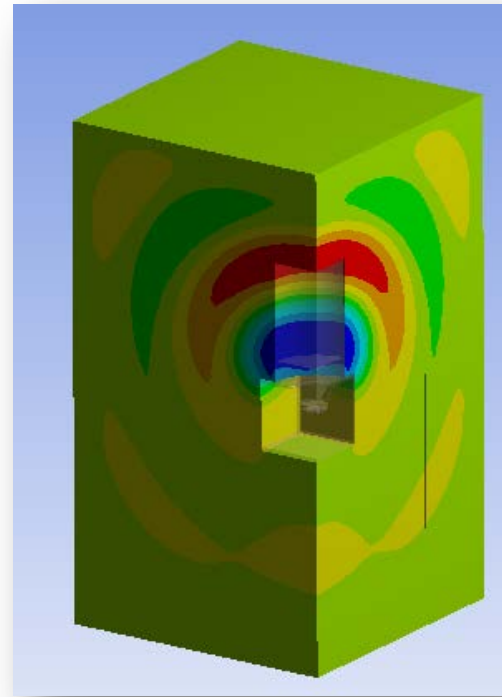
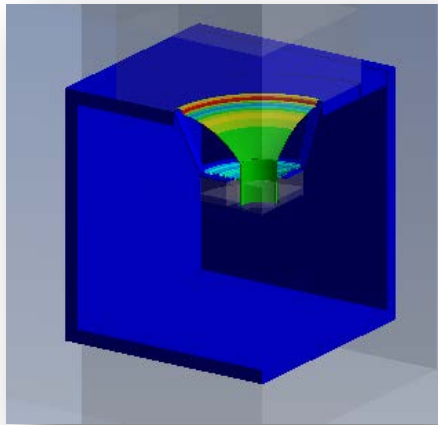
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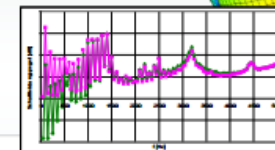
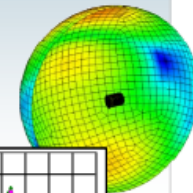
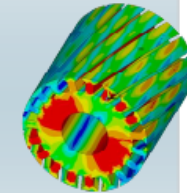
- What is Workbench/Acoustics-ACT?
- Applications and features
- Functionality demo



- Workbench/Acoustics ACT: What is it?
 - Adds 3D acoustics tools and functionality to Workbench Mechanical
 - Define acoustics properties
 - Apply acoustic boundary conditions & loads
 - Assign acoustic-structure interfaces
 - Postprocess acoustic results

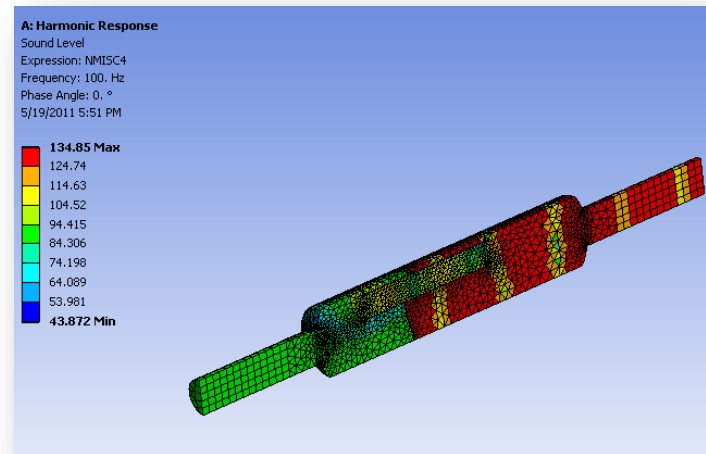
Investigation of the Noise Behavior of an Electric Motor

- Structure: Single phase alternating current electric motor
- Task: Simulate noise behavior for silent operation
- Method: Coupled electro-mechanic, structural-dynamic and acoustic analysis

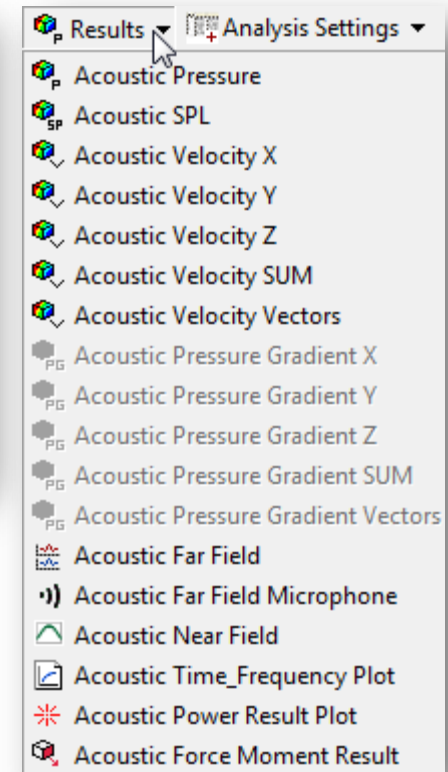
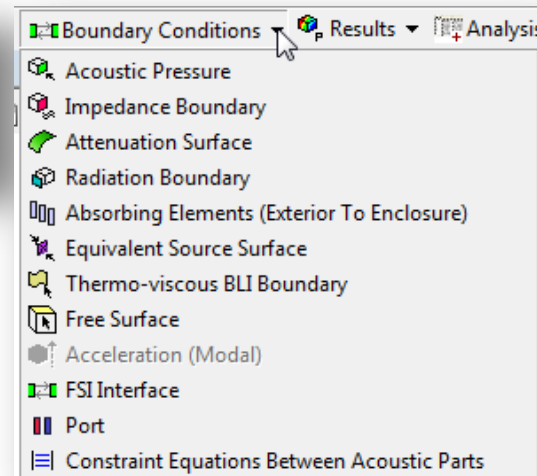
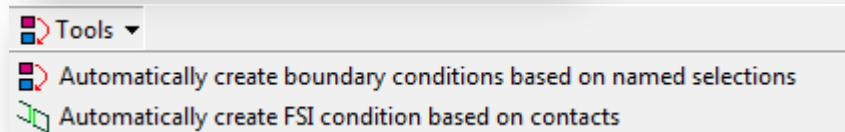
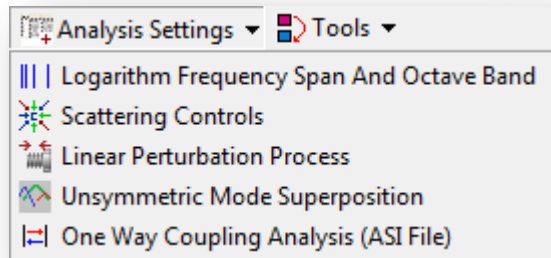
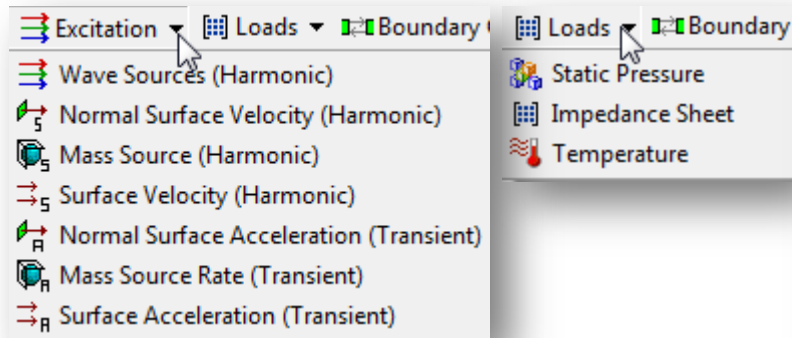


- Applications:

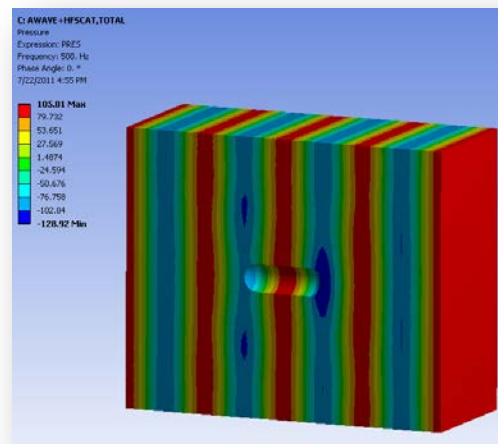
- Acoustics is the study of the generation, propagation, absorption, and reflection of sound pressure waves in a fluid medium. Some applications for acoustics analysis include the following:
 - Buildings and elevators
 - Machinery
 - Vehicles, mufflers
 - Underwater acoustics
 - Design of speakers, speaker housings, acoustic filters, and many other similar devices.



- Workbench/Acoustics ACT menus

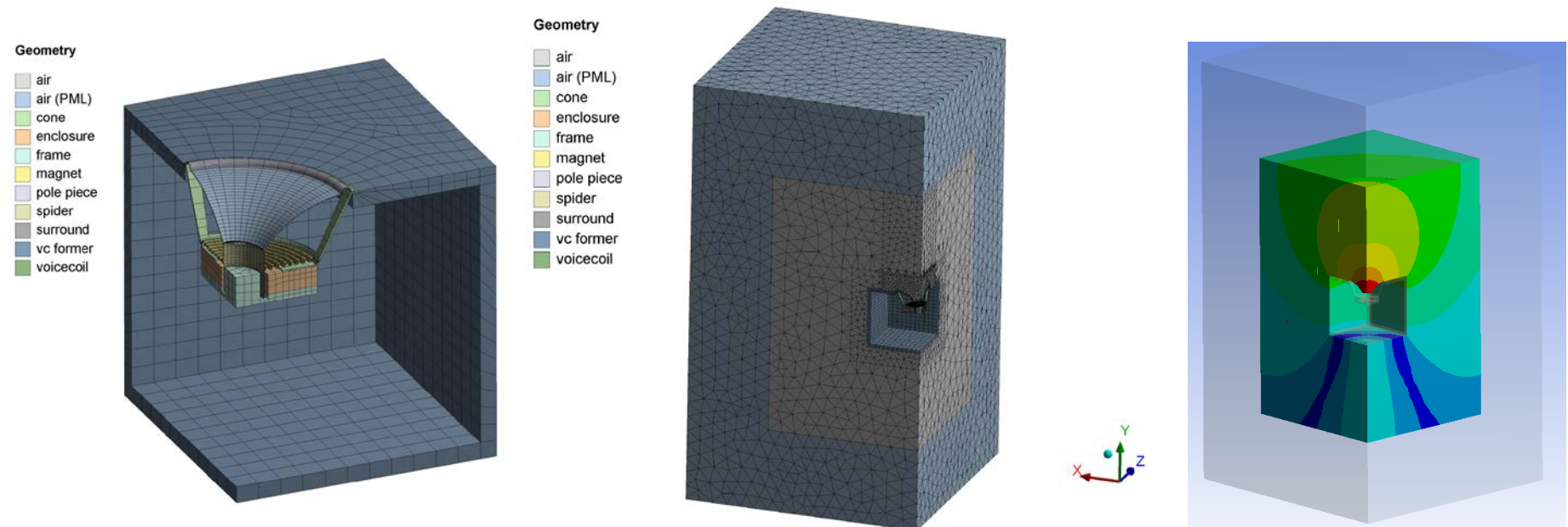


- Can model the fluid medium and the surrounding structure
- Can run modal, harmonic, or transient analysis types.
- Typical quantities of interest:
 - Pressure distribution in the fluid at different frequencies, particle velocity, sound pressure level
 - Scattering, diffraction, transmission, radiation, attenuation, and dispersion of acoustic waves.
- A coupled acoustics analysis takes the fluid-structure interaction into account. An uncoupled acoustic analysis models only the fluid and ignores any fluid-structure interaction.

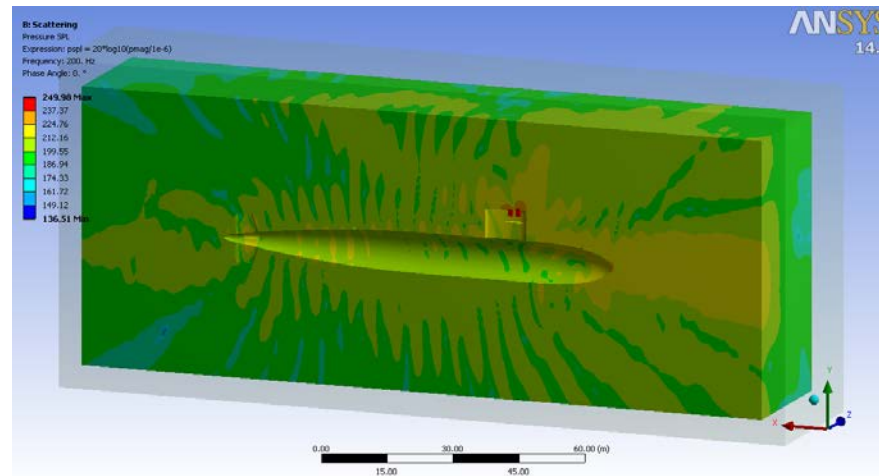


- What is your potential application for acoustics analysis?
 - Noise reduction in machinery or engines
 - Noise reduction in buildings or elevators
 - Noise reduction in vehicles or aircraft
 - Speakers or acoustic filters
 - Other or not sure

- Speaker Analysis
 - $\frac{1}{4}$ Symmetry model
 - Harmonic analysis
- Forces are exerted on the voicecoil, causing it to move. The voicecoil moves the cone which is what displaces the air to produce sound.
- A perfectly matched layer (PML) is used to absorb the outgoing acoustic waves



- There are many acoustics features not covered in this presentation:
 - Non-uniform acoustic medium, which can be a function of temperature or static pressure
 - Acoustic scattering capability and ability to output total or scattered pressure
 - Ability to input bulk viscosity to model viscous losses
 - Mass sources, impedance sheet, normal velocity b.c.
 - Near-field postprocessing
 - Ability to define external planar wave, monopole, dipole sources



- Do you think this tool might be useful in your work?
 - I doubt it
 - Somewhat useful
 - Very useful

- Acoustics analysis requires a license of ANSYS Mechanical or Multiphysics
- If you are a current ANSYS customer you can download the Acoustics ACT extension at no cost.
- The Acoustics ACT Extension for ANSYS 15.0 is available for download on the ACT Extension Library of the ANSYS Customer Portal.
- Training materials are included in the download.

**THANK
YOU**