

Simcenter 3D Acoustics Modeling

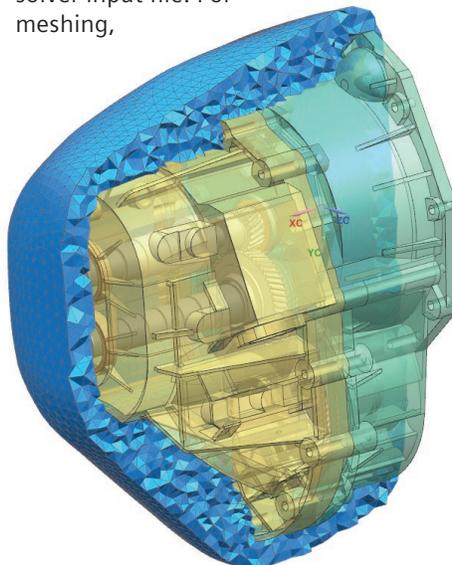
Accelerating the interior and exterior acoustic modeling process for complex geometries

Benefits

- Accelerate the interior and exterior acoustic meshing process for complex geometries
- Rapidly create models for acoustic BEM simulation through a dedicated user interface
- Generate an acoustic simulation model from an existing structural mesh model or associative CAD geometry
- Standard configuration for BEM acoustics analysis, including transfer of structural vibrations to the acoustic fluid domain

Summary

Simcenter 3D Acoustics Modeling software helps you conduct acoustic meshing for NX™ Nastran® software for finite element method (FEM) acoustics analysis, or set up a complete Simcenter™ software acoustics boundary element method (BEM) model. This includes acoustic meshing, applying boundary conditions and generating the solver input file. For meshing,



Simcenter 3D contains all the necessary tools to create an acoustic fluid mesh in a user-friendly way from an existing structural mesh or computer-aided design (CAD) geometry. For BEM acoustics, it contains the complete solver environment with all pre/post functionalities, including the transfer of structural vibrations to the fluid.

Surface wrapper for acoustics

Simcenter 3D Acoustics Modeling includes all the required functionality to efficiently create a fluid domain geometry by surface wrapping a structural mesh and/or a complete CAD assembly model. This can be used to prepare a BEM acoustics analysis. But it's also a good starting point to create acoustic FEM meshes. For FEM exterior acoustics, surface wrapping can be used to create the inner boundary of the fluid domain. For FEM interior acoustics, surface wrapping can be used to start creating a cavity mesh (for example, for the interior of a car body):

- Input models can be elements of a structural mesh, polygon geometry of a CAD model or both
- Output models can be a:
 - Polygon body to be meshed with Simcenter meshing capabilities
 - Polygon body together with its associated 2D mesh (triangular elements)
 - 2D mesh ready to be filled by tetra elements

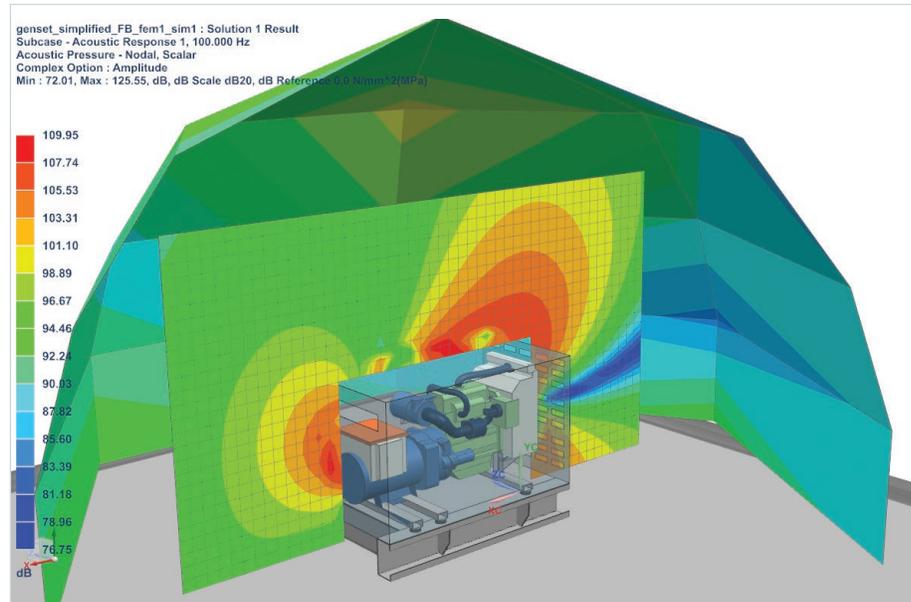
Simcenter 3D Acoustics Modeling

- Generation of a wrap polygon geometry using a CAD model allows you to fully leverage the design-associativity capability of Simcenter
- Support of mesh input for the structural model for generating 2D mesh ensures fast and accurate generation of the fluid domain
- Local constraints enable the wrapper algorithm to be used to coarsen or refine the mesh size locally

Convex mesher

This mesher is used to create a convex surface mesh around an existing meshed part. This convex mesh is used for FEM exterior acoustics with automatically matched layer (AML) technology as the exterior boundary of the fluid domain:

- Input mesh can be defined based on a 2D surface mesh, a close skin mesh of a 3D structural mesh, or a wrapped mesh resulting from surface wrapping of the structural model
- It is possible to define an offset distance from the input mesh to create the void that is later filled by tetra fluid elements
- One infinite plane can be defined. In this case, the convex mesh includes the symmetry plane and is perpendicular to it at the corners
- The size of linear triangular elements can be set directly or computed based on the maximum frequency



Simcenter 3D acoustics BEM modeling environment

The Simcenter acoustics BEM modeling environment contains all the required functionality to prepare your BEM acoustics or vibro-acoustics model for the Simcenter BEM acoustics solver, and postprocess the results. The environment supports both direct BEM (for closed structures only) and indirect BEM. After wrapping the surface, you can rapidly create boundary conditions and acoustical monopole sources, or transfer structural vibrations to the acoustic mesh, generating a ready-to-run fluid simulation model. The modeling environment also includes dedicated postprocessing tools so you can analyze acoustic results and study structural panel contributions.

Creation of Simcenter 3D BEM acoustics analysis:

- Direct BEM – Pure acoustic radiation of a closed model
- Indirect BEM – For interior/exterior acoustics or weakly-coupled vibro-acoustics analysis

Manual boundary conditions and automatic definition of load cases:

- Acoustic pressure and normal acoustic velocity can be applied manually on 2D acoustical elements. The boundary conditions can be constant or dependent on the frequency
- Automatic transfer of structural vibrations to acoustical boundary: Loads are applied automatically on the acoustical element from an imported .op2 or .unv file containing structural vibrations data
- Monopole acoustical sources can be defined in free space representing a pulsating sphere
- Impedance and admittance boundary conditions can be defined on elements
- Structural panels can be defined to analyze contributions to the total acoustical response
- Infinite planes can be created to simulate a global zero normal velocity plane or zero pressure release plane

Vibro-acoustic coupling

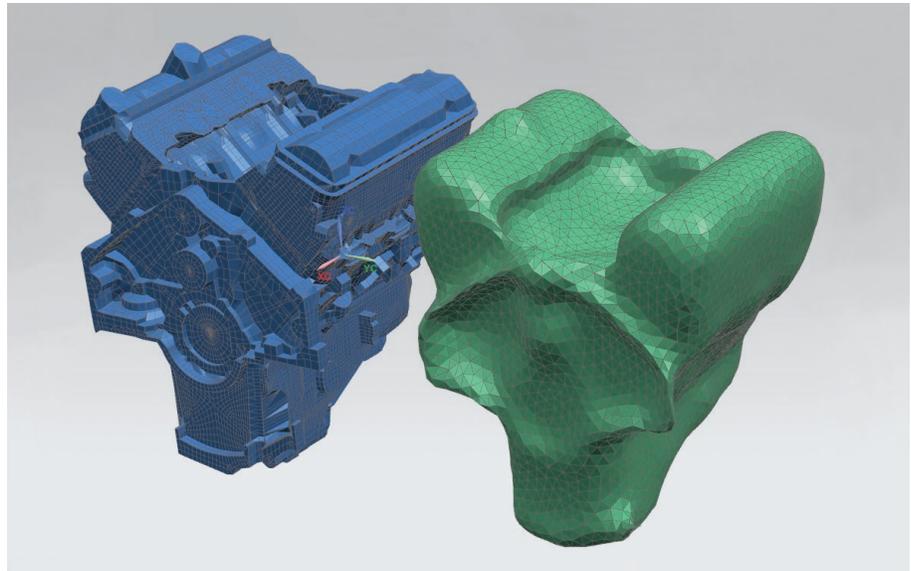
For BEM indirect vibro-acoustics analysis, a coupling algorithm ensures the accurate transfer of structural vibrations to the acoustical elements. You can use parameters and coupling quality color maps to control and accurately visualize the coupling algorithm used in the solver.

Solution definition, solver control and input file creation:

- Frequencies to be calculated can be fully controlled by the user. Frequencies can be manually defined or automatically retrieved from structural vibrations
- In a flexible graphical user interface (GUI), you can control and compute acoustical quantities. You can analyze results for groups of elements or individual microphones
- The simulation model is automatically verified before exporting to the solver. The consistency of the mesh, material and property is checked. User feedback is provided to avoid errors before solving

Application-specific postprocessing of results:

- In addition to standard postprocessing functionalities for visualizing acoustics quantities such as pressure, intensity and velocity, application-specific scenarios can be created to efficiently filter and display function results related to microphones
- Dedicated panel contribution tools allow you to study the contribution of structural panels to the total acoustic response



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