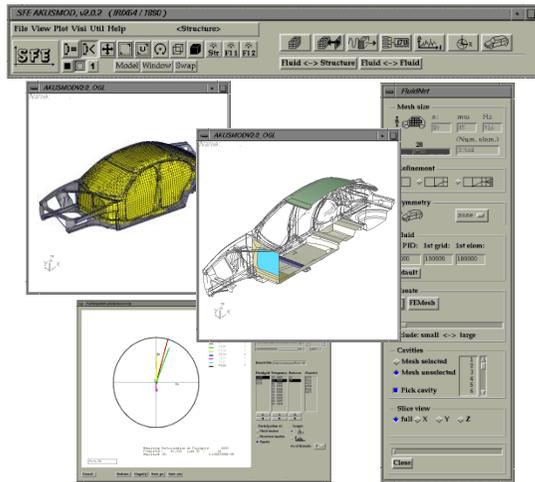


## Powerful Tools for Acoustics and NVH



Noise and vibration analysis  
Simulation of acoustic systems  
Sensitivity analysis  
Optimization

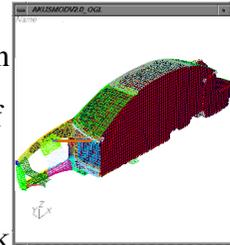
### SFE AKUSMOD™

Assessing the acoustical behavior of lightweight structures, analyzing interior noise issues for road and rail vehicles, applying high-end FEM procedures and algorithms to real-life engineering and design tasks – SFE AKUSMOD™ is the tool of choice for NVH engineers worldwide.

SFE is proud to introduce SFE AKUSMOD™ V2.0, presenting many new and exciting features:

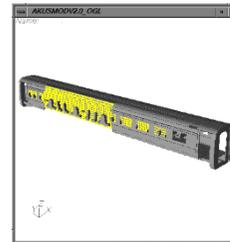
#### Cavity mesh generator

The new cavity identification algorithm enables cavity selection with a minimum of user-input. Create the cavity mesh where you want it – without the time-consuming need to close holes and block side cavities.



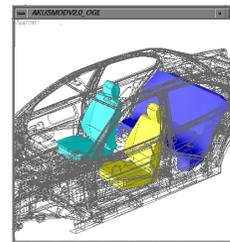
#### Fluid-structure coupling

Prepare the coupling matrix for a virtually unlimited number of degrees of freedom.



#### Acoustical absorbers

Interactive tools at your fingertip: with SFE AKUSMOD™ it is easy to add this important feature to your numerical model.



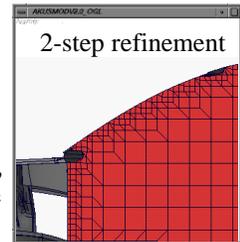
#### Postprocessing

Analyze and assess NVH results in a quick and comfortable way.

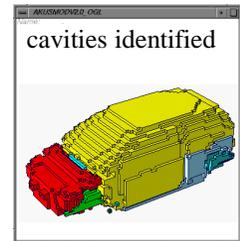
### Cavity Mesh Generation

The SFE AKUSMOD™ cavity mesh is generated automatically within the structure FEM model. All you have to do is to load the structure and to set the fluid element size. SFE AKUSMOD's new cavity identification algorithm prevents fluid elements of any size from leaking into, or being generated within, unwanted side cavities (members, pillars): no more time-consuming closing of holes and structure openings!

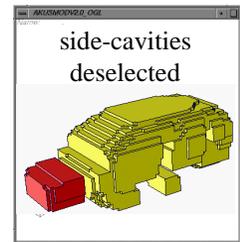
**Mesh size:** simply request a target frequency or an element edge length. As an option, the mesh can be refined towards the structure, leaving a coarser mesh in the cavity center.



**Cavities:** select or pick cavities to be excluded from meshing. Once excluded, a side-cavity will remain vacuum, regardless of any existing holes or openings towards the main cavity.



**Holes/openings:** use a slider to set the maximum size of holes, fluid elements are allowed to leak through.



**Fluid mesh quality:** new algorithms guarantee high-quality hexa-dominant fluid meshes, perfectly following the interior shape of the surrounding structure.

## Optimization of design processes by using powerful simulation tools

SFE software tools offer important product knowledge in early development stages by using virtual prototypes. Focal points of SFE services and products are: saving development time and costs, shortening time-to-market cycles and improving product properties.

**SFE software:**  
 SFE CONCEPT®, SFE CONCEPT RAIL,  
 SFE AKUSRAIL, SFE AKUSMOD™,  
 SFE MECOSA

**OEM references:**  
 BMW, Mercedes-Benz, Fiat, Ford, GM, GM-Daewoo, Chrysler, Honda, Jaguar, Land Rover, Mazda, Mitsubishi, PSA, Porsche, Brilliance, Volvo, VW.

## Gesellschaft für Strukturanalyse in Forschung und Entwicklung mbH

SFE GmbH  
 Voltastr. 5  
 13355 Berlin



sfe@sfe-berlin.de  
 www.sfe-berlin.de  
 Phone: +49-30-467767-0  
 Fax: +49-30-4639030

**President and CEO:**  
 Dipl.-Ing. Hans Zimmer



## Fluid-Structure Coupling

The structure's vector degrees of freedom are coupled to the fluid's scalar DOF. This is a numerical process, i.e. no special interface elements have to be generated. The application of this module is basically a matter of pushing a button.

**Fluid-fluid coupling:** automatically couple two distinct fluid models using MPC equations.

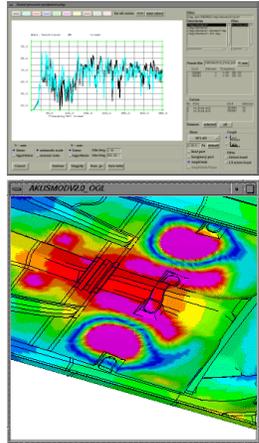
## NVH Postprocessing

Use SFE AKUSMOD™ to identify structure parts with a high potential for acoustic optimization:

**Punch file processing:** create preview diagrams, export to ascii tables.

**Participation processing:** noise is caused by a complex superposition of fluid modes and structure modes:

- Which fluid modes or structure modes increase the noise?
- Are there specific panels responsible for the noise level?

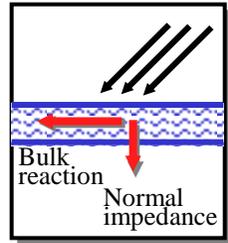


**Fringe plot postprocessing:** Every wetted structure grid participates, with a small percentage, in the total sound pressure at a given frequency. Visualized as fringe plots on the wetted structure, even very small noise-emitting areas can be localized.

## Acoustic Absorbers

SFE AKUSMOD™ provides two absorber types to simulate porous materials with frequency dependent properties. Entering or importing absorption data as well as declaring absorber areas is a quick and easy task.

**Plane absorber:** in addition to the normal impedance, this type also considers sound propagation within the absorber, i.e. parallel to the absorber plane (bulk reaction). The absorption properties are applied to cavity boundaries.



**Volume absorber** properties (porosity and flow resistance) are interactively applied to finite fluid elements.

