CADFEM Consulting

ANSYS®/SBSOUND 2.1 (Structure-Borne Sound)

Structure-Borne Sound Analysis of Vibrating Structures with ANSYS

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Task

Frequency response analysis is a standard analysis task in the development of vibrating structures. It determines both the amplitude distribution of the displacements, represented as a contour plot at a specific frequency, and the corresponding frequency response at one or several result nodes of the model. Neither kind of representation, however, provides a complete picture of the acoustic behavior of a given structure. Well-established methods and analysis programs, e.g. boundary element techniques or ANSYS FLUID30/FLUID130 acoustic finite elements, are available for analyzing radiated air-borne noise, permitting the in-depth assessment of sound pressure and power. In many cases, however, during the early design stages, it is sufficient to assess acoustic behavior quickly and inexpensively without carrying out any additional analyses.

Lösung

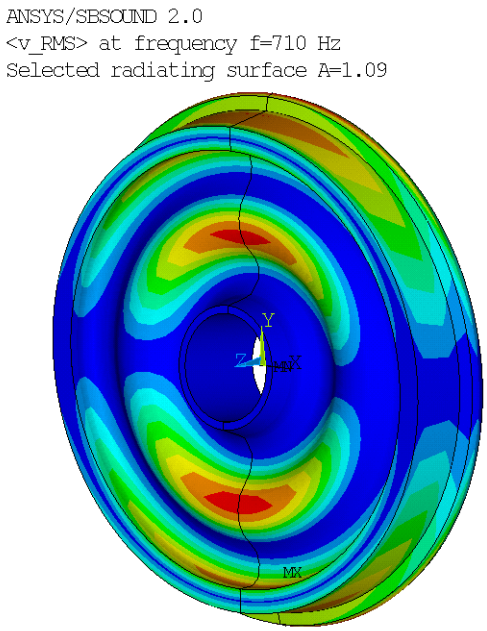
SBSound analyzes structure-borne rather than air-borne sound, as described in relevant machine acoustics literature. Said analyzes based on the modal superposition method can be carried out quickly and efficiently – normally taking just a couple of minutes.

ANSYS/SBSOUND computes the following results:

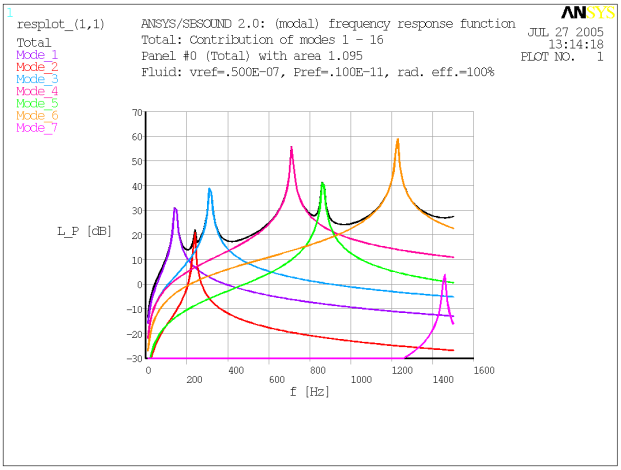
- frequency response function (FRF) of structure-borne sound power;
- the mean square velocity (surface average);
- optionally both quantities represented in terms of level [dB];
- contribution of distinct modes and/or selected panels for the quantities above presented as FRF (bottom right figure) to determine acoustic "hot spots" quickly;
- contribution of distinct modes and/or selected panels at a fixed frequency presented as a bar chart;
- contour plots of the surface normal velocity for discrete frequencies (top right figure).

Further developments are available on request, including:

- taking a weighted average of the results in third and octave bands;
- A-weigthed levels [dB(A)];



Distribution of the normal surface velocity at a discrete frequency. This structural vibration shows to be primarily important for sound radiation.



Postprocessing with ANSYS/SBSOUND: illustration of the structure-borne sound level (black envelope curve) together with modal contributions of the relevant modes (co-lored curves).

Courtesy of Deutschen Bahn AG