

The acceptability of modern machines is nowadays not only determined by their functionality. In many cases the level of comfort is decisive and this is related to the use of a certain level of technology. The noise level is a typical example of such a comfort parameter. The optimisation of such comfort parameters are becoming important during the planning of a new machine and this leads to more importance for the simulation of noise and acoustic emissions.

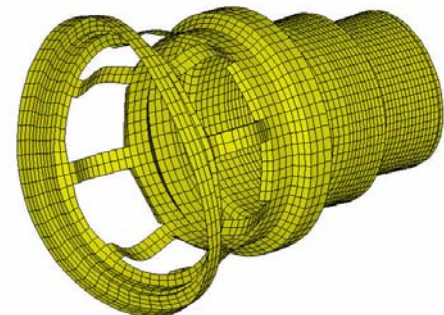
In recent years acoustic simulations have become possible thanks to the development of highly accurate numerical algorithms. This development is a key technology in many technological segments, as development costs can be reduced through the introduction of virtual product development. Initial acoustic predictions can already be made in a very early project phase, without the need to build a prototype.

Noise sources

An acoustic simulation consists in general of a numerical simulation of the sound wave propagation. Effects such as noise reflection and dispersion and the different impact of soft or hard materials play a major role. The noise sources for such simulations can be selected in two ways:

- Direct specification of a noise source (for example the radiation of an object with the help of a loudspeaker)
- Sound radiation of a vibrating pump or the noise of an air flow over a sharp edge (for example the wing mirror of a car).

These noise sources can nowadays be simulated with acoustic or aeroacoustic methods.



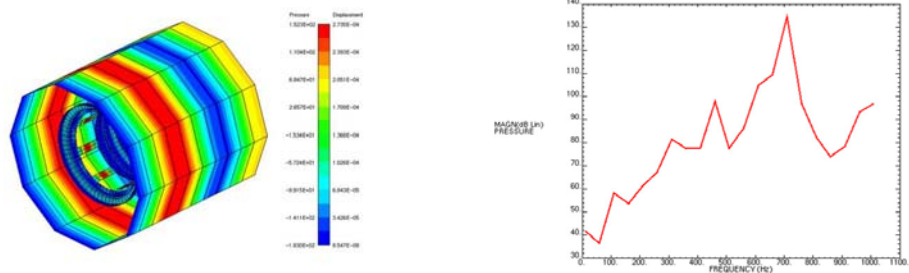
Representation of a vibrating pump casing

The sources can be defined as follows:

- From a FEM-Modal analysis of a complex structure (e. g. a casing)
- From a vibration analysis of a complex component as a result of a specific exciting force.
- From aerodynamic noise sources, which need to be calculated in advance with numerical flow simulation.

Analysis possibilities

As an analysis tool, the acoustic or aeroacoustic simulation provides the noise level for each analysed frequency at each specified position of the investigation. The simulation also provides the possibility of examining specific questions with regard to the optimisation of the component.



Presentation of the spatial distribution of the noise level for a specific frequency (left) and the distribution of the noise level for different frequencies (right)

Customer benefits

Acoustic simulations can be carried out on a virtual prototype during the preliminary stages of a real prototype development. In this way there is a lot of potential to optimise the product and to reduce the development time and costs.