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Simulation of noise in HVAC ducts



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For an automotive HVAC system the noise created and perceived by the occupants is an important factor that has to be accounted for. The system has to create an environment which provides a sufficient amount of cooling or heating to keep the occupants comfortable, but not at the detriment of excessive noise due to the air flow. Therefore the HVAC duct system has to be designed to deliver the air efficiently and quietly into the cabin.

To achieve such desirable conditions the system has to be designed early in the vehicle programme using CAE techniques. CFD methods are maturing in the area of aeroacoustics simulations and are now able to provide the engineering data that allows better HVAC duct designs to be developed.

In this presentation a method for simulating the noise source generation inside the duct, as well as the noise propagation from the duct to the near field immediately downstream of the duct, will be introduced.

An important feature of this method is that all the simulations are performed using STAR-CCM+ and that no third party software is required. The results will be validated against experimental measurements to illustrate the accuracy of the methodology over the frequency range of interest. The results will be presented in terms of noise level spectra.

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