APPLICATION OF FLOW VISUALIZATION IN REAL-LIFE ACOUSTIC FIELDS

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Abstract

Visualization system, by serving a dual role as a provider of exploration and exposition capabilities, have became indispensable to the analysis of computational fluid dynamics (CFD) results. In the acoustical practice, up until the last two decades, the study of vectors acoustic fields and noise flow visualisation are rather seldom. To day, flow motion as the acoustic particle velocity may be measured experimentally using sound intensity (SI) probe, which can be used to collect the data to visualisation all the phenomena occurring in investigated acoustic vector fields even in three dimensional space.

The sound intensity has become one of the most interesting measurement techniques employed in solving vibroacoustic problems as well as in acoustic metrology, which simplifies the technique of measurements thus effectively replacing classical methods. Measurements can be conducted in the near field and in the presence of secondary and parasitic noise. This is a crucial asset in tests involving industrial acoustics and that is why the method is significant both practically and cognitively.

In the proposed paper author have described the visualization methods in acoustic flow fields and showed how these methods may assist scientists to gain understanding of complex acoustic energy flow in real-life field. A graphical methods will be presented to determine the real vector distribution in 3D flow wave field. Visualization of research results are shown in the form of a intensity streamlines in space and as a shape of floating acoustic wave and intensity isosurface in three-dimensional space, which is unavailable by conventional methods using a microphone.

Direct measurement of the flow intensity sound as the energetic fields and graphically description of the results, can explain a diffraction and scattering phenomena occur on the real acoustical barriers and solved in practical way a lot of engineering problems. For instance, the flow of acoustic energy presented by the intensity streamlines (they a graphically change on the ribbons) shows the way of energy flow in acoustic field. Showing the paths along which it is transmitted may be very useful when the necessity arises to visualize the "shape of noise" radiated by vibrating mechanical structures (machines, vibrating heterogeneous plates, equipment's, etc.) and can show their activity also in limited spaces. This is a form of qualitative analysis for stationary fields which consists in a complex evaluation of the paths along which the acoustic energy of a radiating source is transported.

Based on the research with intensity technique and using selected visualizations methods, in the publication are demonstrate many examples of vector space distribution of the real-live acoustic field, illustrate the application of the SI measurement for practical problems at the acoustical diagnostic and noise abatement.