NUMERICAL INVESTIGATION OF AERODYNAMIC NOISE IN CONFINED FLOWS

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Noise can be generated by structural vibrations, flow field, thermal processes. This project focuses on noise generation in industrial piping, due to turbulent flow, obstruction, bends. There exist many numerical approaches to solve the problem of sound generated and propagated in a flow field (Computational AeroAcoustics). We concentrate on using so called hybrid methods. First one solves the dynamics of the flow (Large Eddy Simulation). The data obtained from a transient calculation is used to define the sound source using the aeroacoustic analogy (Lighthill, Curle...). The sound is then propagated in a separate simulation/code.

By studying the academic problems we attempt to define a procedure for acoustic computation in industry using/modifying commercial codes. The influence of different inflow/outflow boundary conditions (i.e. convective boundary conditions), mesh resolution, the flow solution accuracy, and the analogies used on the acoustic field is studied.

Sound generated by vortex shedding behind a confined square cylinder is being solved. The flow regime is turbulent (Re=5000). The flow field is obtained by incompressible LES in Fluent and results exported for further calculation in SYSNOISE.

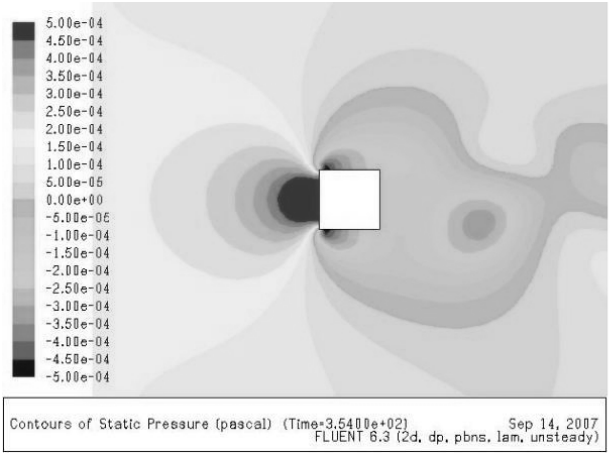

Figure 1: Instantaneous static pressure map around the cylinder

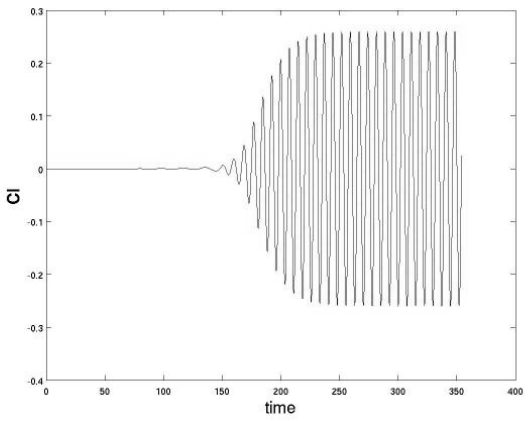

Figure 2: Lift coefficient evolution in time

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