Chisachi Kato LAB.

[Numerical simulation of unsteady fluid flows]

Center for Research on Innovative Simulation Software

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Thermal Energy Conversion Systems

Department of Mechanical Engineering

Numerical simulation of unsteady fluid flows

Prediction and reduction of fluid noise caused by fluctuations in flow have become key technical issues in the development of turbo machinery and vehicles that run at high speed. This laboratory examines the mechanisms behind the generation of fluid noise, develops techniques to reduce that noise, and performs basic and applied research to formulate a numerical analysis method for fluid noise.

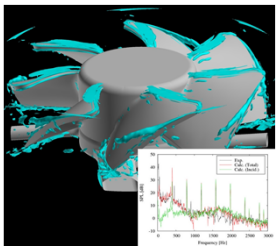

Figure 1 Instantaneous vortex structures

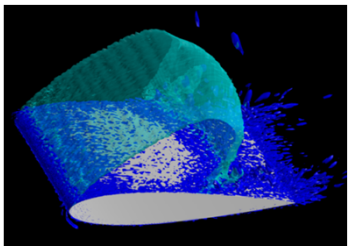

Figure 2 Structure of cavity and vortices

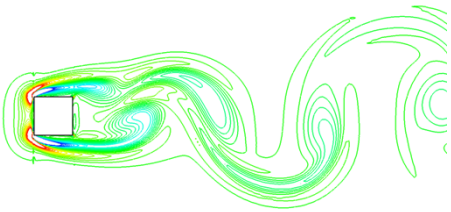

Figure 3 Distribution of Lighthill' acoustic source

Research on energy conversion systems

Recent trends toward reducing environmental load and using energy effectively have generated interest in thermoacoustic engines that can operate efficiently with relatively low-temperature heat and no moving parts. This laboratory is researching the following themes from the viewpoint of thermofluid dynamics.

The recent appearance of humanoid robots and the explosive spread of portable devices have led to expectations for the development of compact and lightweight portable power supplies. Power supplies in the form of ultra micro gas turbines (UMGT) with impellers of several mm to several tens of mm in size are thought to be promising candidates in terms of both output density and energy density.

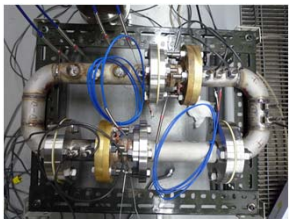

Figure 4 Heat-driven thermoacoustic refrigerators

Figure 5 Fabricated bump foil bearings