Chisachi KATO LAB.

[Numerical simulation of unsteady fluid flows]

Center for Research on Innovative Simulation Software

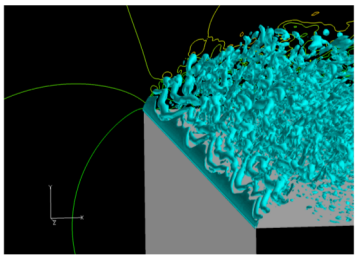
http://ckato.iis.u-tokyo.ac.jp/

Department of Mechanical Engineering

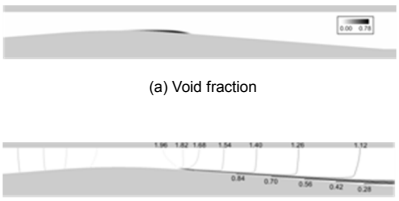
Thermal Energy Conversion Systems

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.



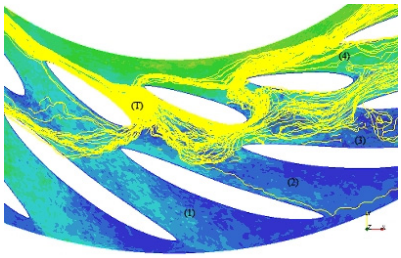
Instantaneous vortices distributions



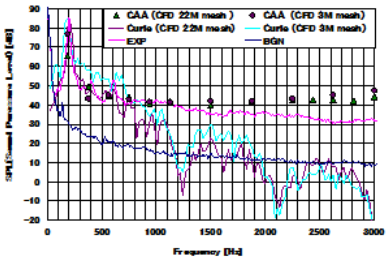
(a) Void fraction

(b) Streamwise velocity (non-dimensional)

Flow distribution in venture (σ = 2,95)



Instantaneous streamlines, after 33 impeller revolutions, passing through the guide vanes throat (T)

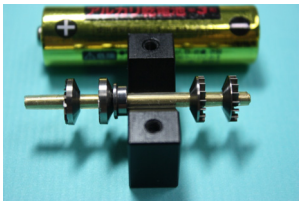


Sound pressure calculated by Lighthill Equation

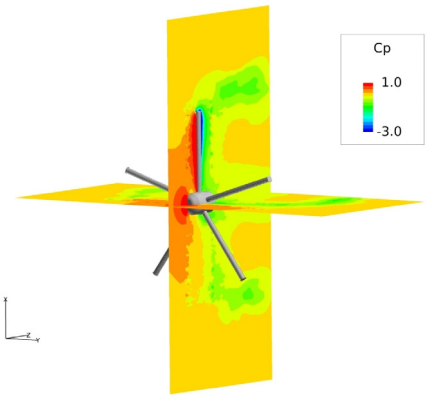
Research on energy conversion systems

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.

Turbine rotor



AA battery sized gas turbine



Pressure distribution around the Magnus wind turbines with spiral fines