



# Chisachi KATO LAB.

[Numerical simulation of unsteady fluid flows],  
[Research on energy conversion systems]

Center for Research on Innovative Simulation Software

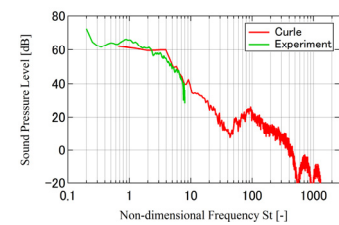
<http://ckatolab.iis.u-tokyo.ac.jp/>

Thermal Energy Conversion Systems

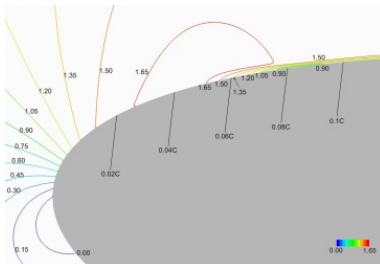
Department of  
Mechanical  
Engineering

## Numerical simulation of unsteady fluid flows

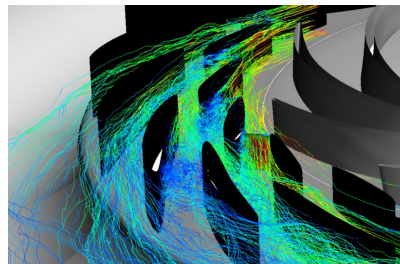
Prediction and reduction of fluid noise caused by fluctuations in flow have become key technical issues in the development of turbo machinery and vehicles that run at high speed. This laboratory examines the mechanisms behind the generation of fluid noise, develops techniques to reduce that noise, and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



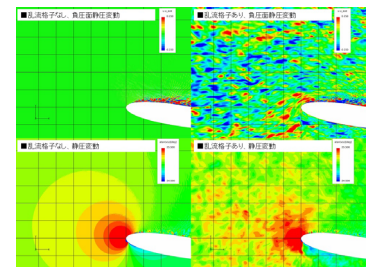
(a) Sound pressure level



Velocity distribution around the airfoil  
NACA0015 ( $\sigma = 0.23$ )



Instantaneous streamlines passing through  
the guide vanes throat



(b) Velocity and pressure distributions

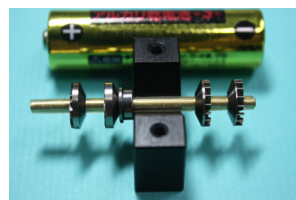
Prediction of fluid noise around the airfoil with  
gust flow

## Research on energy conversion systems

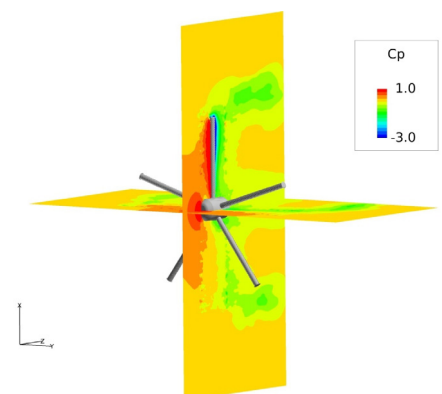
The recent appearance of humanoid robots and the explosive spread of portable devices have led to expectations for the development of compact and lightweight portable power supplies. Power supplies in the form of ultra micro gas turbines (UMGT) with impellers of several mm to several tens of mm in size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



Turbine and compressor rotor



AA battery sized gas turbine



Pressure distribution around the Magnus wind turbines with  
spiral fins