

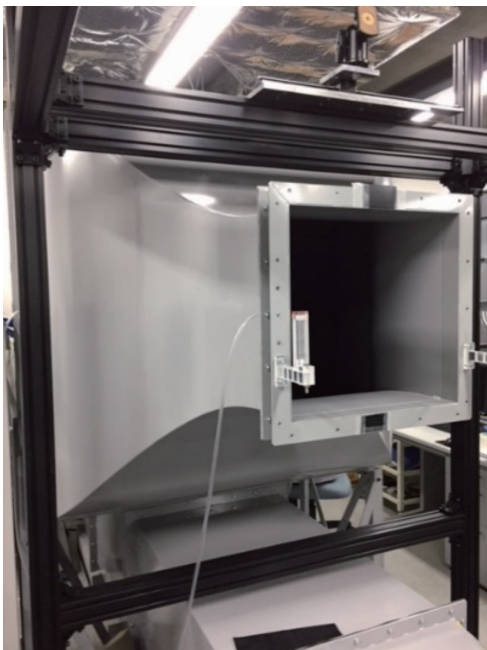
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### Purpose of Research

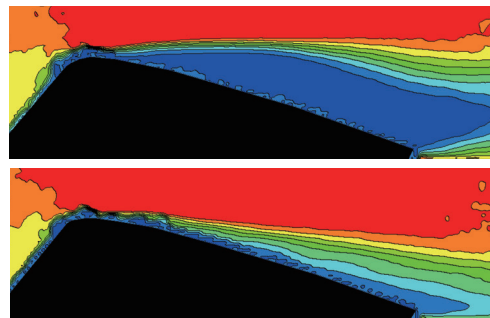
Fluid machinery, such as pipelines, wings, pumps and blowers, are widely used in engineering application. But it is difficult to study and analyze the behavior of their working fluids, such as air, water and oil, since most of them are invisible. By using dedicated measuring instruments and utilizing our expertise, our laboratory can visualize flows and efficiently measure flow velocity and flow structure. We propose flow control technologies and develop devices that are useful for improving the efficiency of fluid machinery.

### Summary of Research

We can visualize flows using smoke-wire, tracer and other techniques, and can measure flow rates and flow velocities using flowmeters, hot-wire anemometers, and particle image velocimetry (PIV), etc. Objects brought into our laboratory can be measured using our wind tunnel equipment, and we can also conduct analysis under multiple conditions using numerical simulation.



Wind tunnel equipment with 400 × 400 mm outlet



Flow visualization (separation from a wing)



Optical control of fluid viscosity

### Comparison with Conventional or Competitive Technologies

- Ability to visualize invisible fluids
- Measurement instruments specifically designed for measuring flow rates and flow velocities
- Abundant expertise regarding fluid control
- Two approaches to analysis: experiment and numerical simulation

### Expected Applications

- Proposing design specifications for equipment
- Performance evaluation and improvement of equipment
- Proposing and developing control methods and devices to suppress flow transition and separation
- Optical methods for controlling fluid viscosity

### Points

- **Flow visualization**
- **Flow velocity measurement using hot-wire anemometers and PIV, and vector analysis**
- **Wind tunnel equipment with an outlet of 400 × 400 mm, and other advantages**

### Future Developments

We also aim to develop new types of flow-control devices such as plasma actuators and optical methods to control the viscosity of fluids.

- **Research Structure:** Successful history of conducting joint research with public and private institutions
- **Awards:** Awarded for our contributions by the Fluids Engineering Division, Japan Society of Mechanical Engineers
- **Technical Guidance:** Abundant experience in providing technical guidance