Development of a New Blade Profile for a Vertical Axis Wind Turbine
S. Yoshioka

1. Ritsumeikan University, Department of Mechanical Engineering, Kusatsu, Shiga, 525-8577 Japan

Introduction
To improve rotation performance of vertical axis wind turbine, we propose new blade cross section Type-B effective for wide range of wind speed. Its performance is evaluated by numerical simulation and wind tunnel experiment.

Steady numerical analysis

Unsteady numerical analysis (Rotating three blades)

Decay of $C_l$ at A is caused by decrease of airspeed. Decay of $C_l$ at B is caused by entering wake of following blade.

Wind tunnel experiments (Single blade)

Results obtained by experiments (▲, ○) and numerical simulations (solid and broken lines) agree qualitatively.

Flow structure (velocity vectors, pressure distribution)

Type-A ($\theta = 90$ deg)

Type-B ($\theta = 90$ deg)

Type-A ($\theta = 45$ deg)

Type-B ($\theta = 45$ deg)

Conclusion
(1) Proposed new blade generates rotor driving torque larger than conventional blade profile.
(2) Pressure distribution and velocity vector obtained by PIV show the difference in flow structures around the blades. Flow separation over the blade is suppressed in proposed new blade.