SU2 9주차 보고서

2019011579 김세형

Pitching & Plunging

RAE2822

Simulation Condition

- COMPRESSIBLE FREE STREAM
  - MACH_NUMBER= 0.3
  - AOA= 17.0
  - FREESTREAM_TEMPERATURE= 293.0
  - FREESTREAM_PRESSURE= 101325.0
  - REYNOLDS_NUMBER= 1000.0
  - REYNOLDS_LENGTH= 1.0

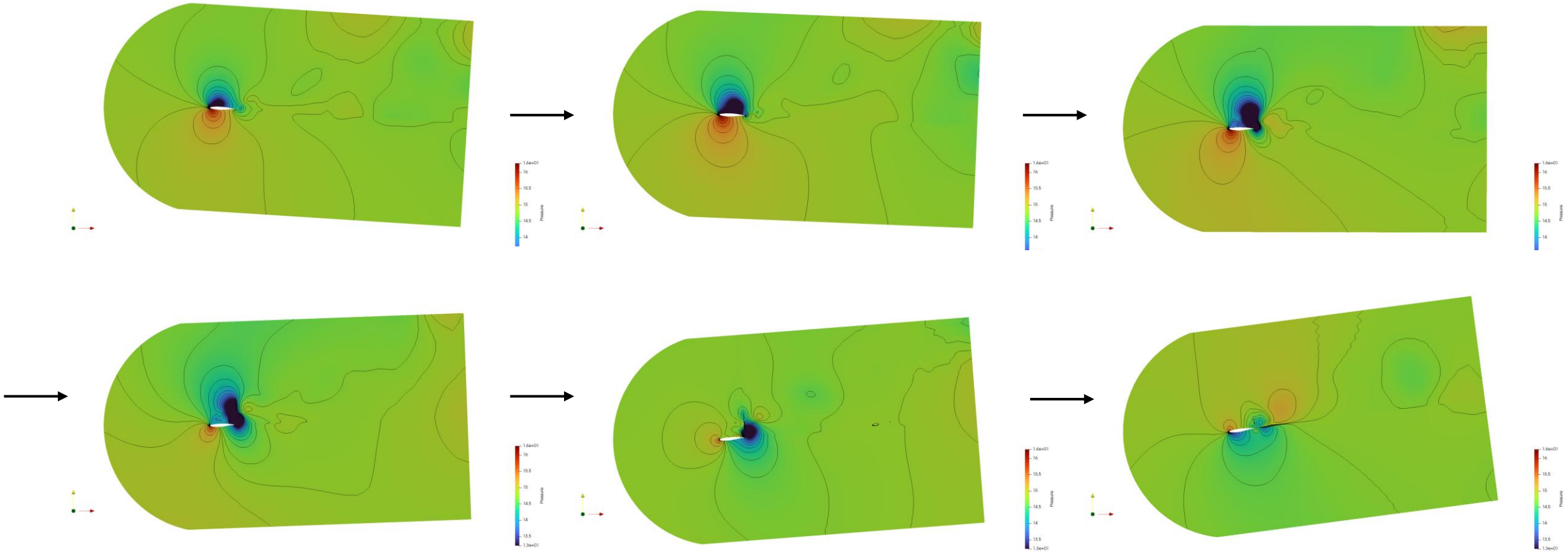
- BOUNDARY CONDITIONS
  - MARKER_HEATFLUX= (airfoil, 0.0)
  - MARKER_FAR= (farfield)
  - MARKER_PLOTTING= (airfoil)
  - MARKER_MONITORING= (airfoil)

- DISCRETIZATION
  - TIME_STEP= 0.002355

- PITCHING & PLUNGING MOTION PARAMETERS
  - GRID_MOVEMENT= RIGID_MOTION
  - MOTION_ORIGIN=(0.25,0.0,0.0)
  - PITCHING_AMPL=(0.0,0.0,8.0)
  - PITCHING_OMEGA=(0.0,0.0,14.91675)
  - PLUNGING_OMEGA= 0.0 30.0 0.0
  - PLUNGING_AMPL= 0.0 1.01 0.0
- INNER CONVERGENCE
  - INNER_ITER= 10
  - CONV_FIELD= REL_RMS_DENSITY
  - CONV_RESIDUAL_MINVAL= -3
  - CONV_STARTITER= 0
- TIME CONVERGENCE
  - TIME_ITER= 2000
- INPUT/OUTPUT
  - OUTPUT_FILES= (RESTART, PARAVIEW)
  - OUTPUT_WRT_FREQ= (1, 1)

Analisys

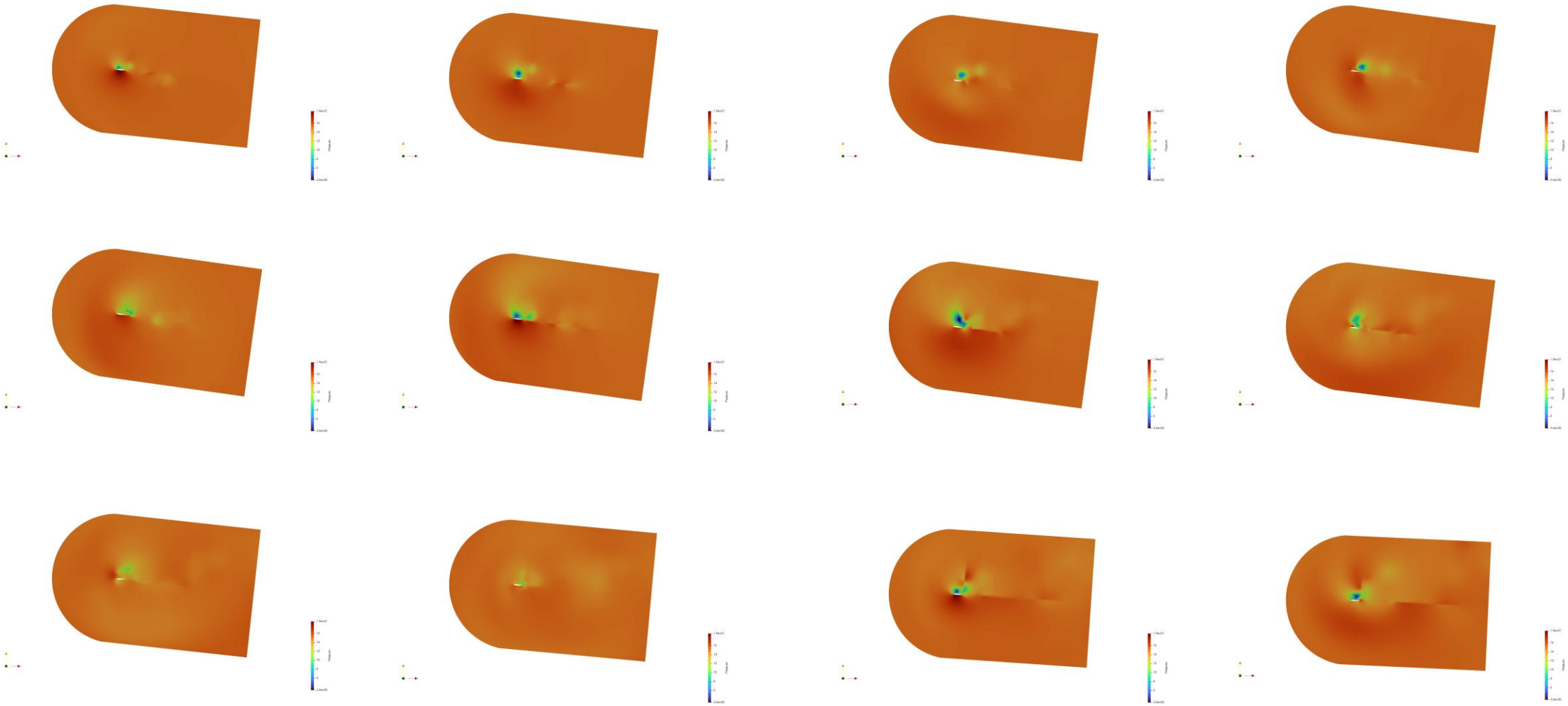
- Airfoil이 plunging(급락) 할 때 airfoil 윗면에 순간적으로 저압영역이 형성되어 뒷전방향으로의 이동을 확인함.
- Airfoil이 반대방향으로 운동할 때는 airfoil 아랫면에 저압, 윗면에 고압이 형성되지만
  그 변화범위가 plunging 할 때의 압력의 변화범위보다 작음.
- 후류의 압력 분포는 airfoil 기준으로 위, 아래가 비대칭적으로 발생됨.



Pitching & Plunging

NACA0012

Pressure Contour



Caradonna-Tung

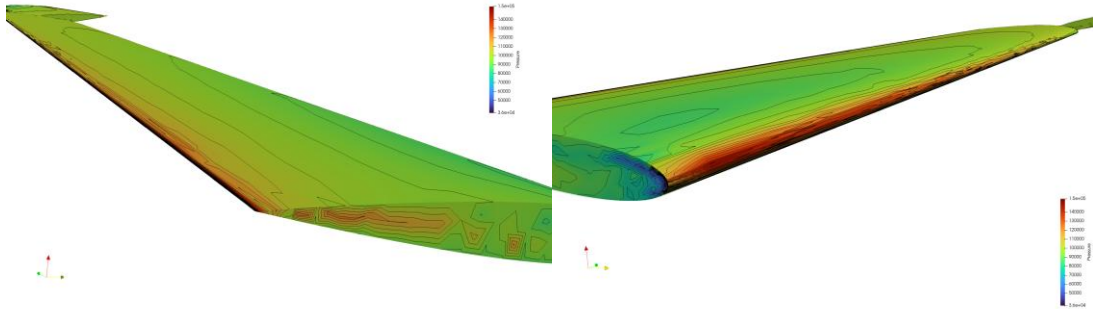
Simulation Condition

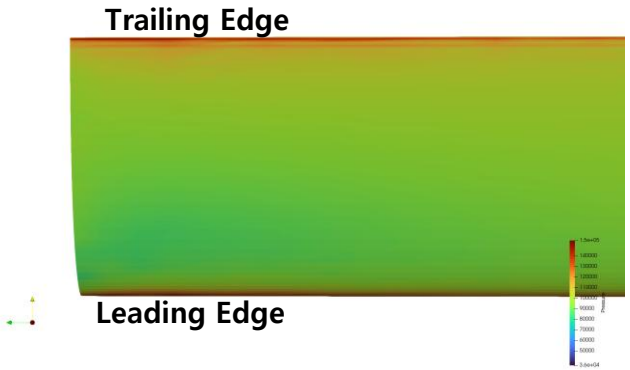
- COMPRESSIBLE AND INCOMPRESSIBLE FREE-STREAM DEFINITION
  - MACH_NUMBER= 0.0
  - AOA= 0.0
  - SIDESLIP_ANGLE= 0.0
  - FREESTREAM_TEMPERATURE= 288.15
  - FREESTREAM_PRESSURE= 101325.0
- DYNAMIC MESH DEFINITION
  - GRID_MOVEMENT= ROTATING_FRAME
  - MACH_MOTION= 0.877
  - MOTION_ORIGIN= 0.0 0.0 0.0
  - ROTATION_RATE = 261.79938779914943 0.0 0.0
- BOUNDARY CONDITION DEFINITION
  - MARKER_EULER= (blade_1, blade_2)
  - MARKER_FAR= (farfield)
  - MARKER_PLOTTING= (blade_1, blade_2)
  - MARKER_MONITORING= (blade_1, blade_2)
- DISCRETIZATION
  - TIME_STEP= 0.002355
- MULTIGRID PARAMETERS
  - MGLEVEL= 3
  - MGCYCLE= W_CYCLEMG_
  - PRE_SMOOTH= (1, 2, 3, 3)
  - MG_POST_SMOOTH= (0, 0, 0, 0)
  - MG_CORRECTION_SMOOTH= (0, 0, 0, 0)
  - MG_DAMP_RESTRICTION= 0.9
  - MG_DAMP_PROLONGATION= 0.9

Caradona-Tung Surface Pressure Contour

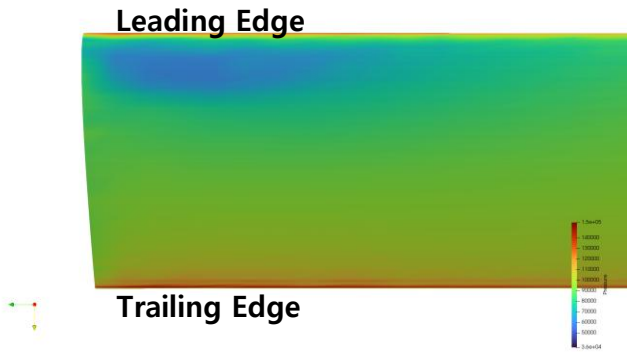
Caradona-Tung lower

Caradona-Tung upper

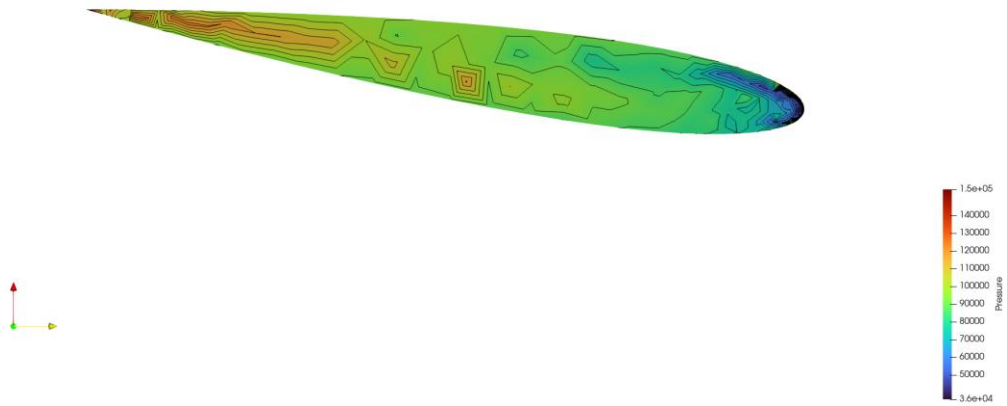




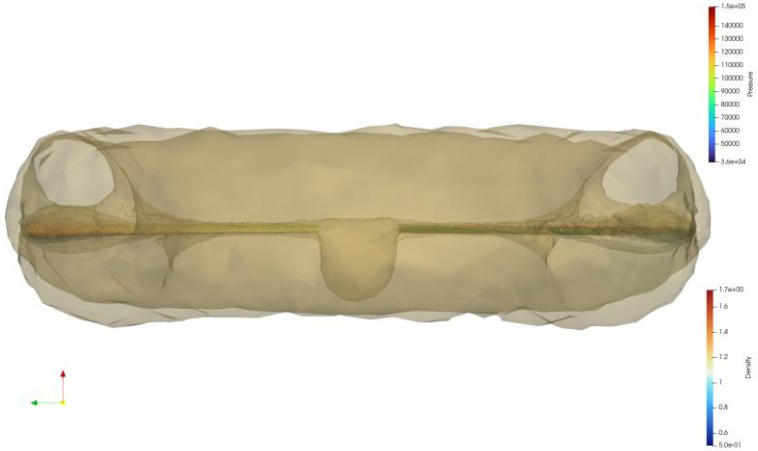
Caradona-Tung Tip lower



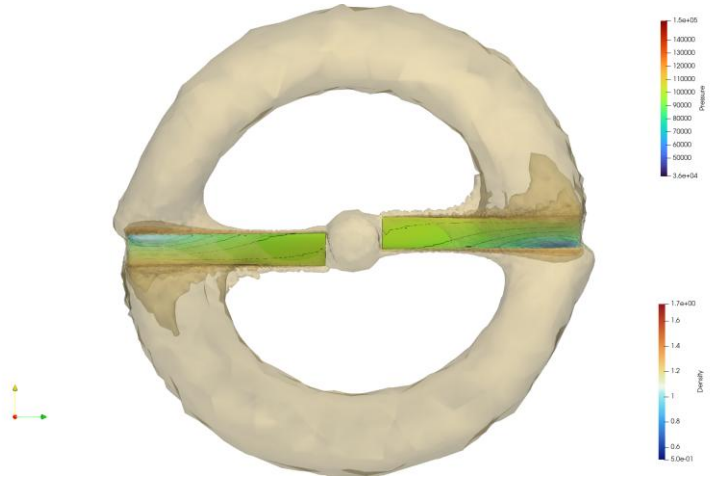
Caradona-Tung Tip upper



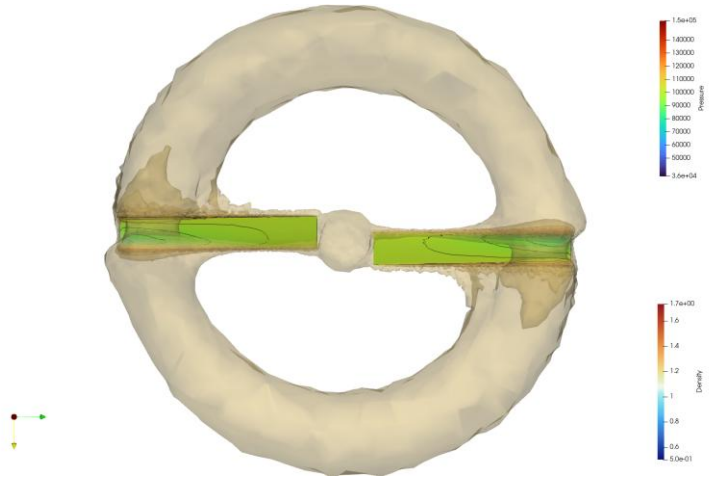
Pressure & Density Contour



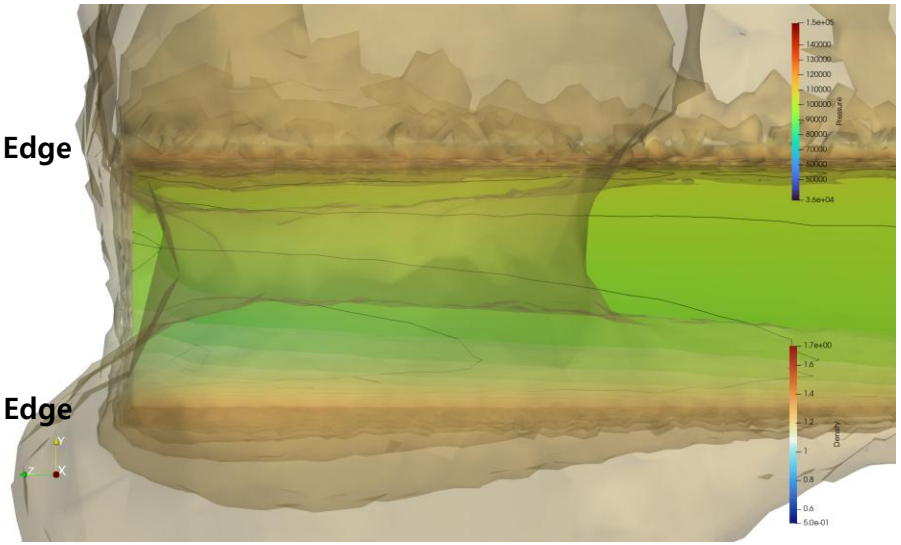
Side



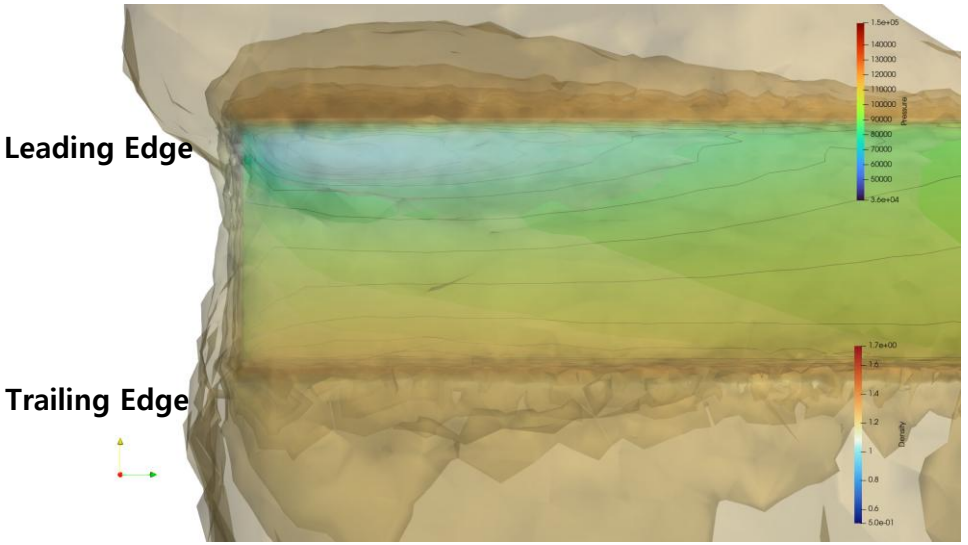
Upper



Lower



Lower tip



Upper tip

Analisys

- Rotor blade upper surface 보다 lower surface 에서 보다 높은 압력 형성.
- Rotor blade surface upper surface leading edge 에서는 저압,
  Rotor blade surface lower surface leading edge 에서는 고압이 형성.
- Leading edge 와 Trailing edge 모두 국소적으로 고압이 형성.
- Wing tip 부근의 Leading edge 에 고압이 형성.
- Blade 아래 방향으로 down wash가 형성됨을 확인.