SC/Tetra

Cradle
MSC Software Company

Analysis of Fan Noise Using SC/Tetra and Actran Aero Acoustics

Analysis Workflow

1. Perform fluid analysis using SC/Tetra
2. Export analysis results in CGNS format
3. Generate sound source data using Actran Aero Acoustics
4. Perform acoustic analysis using Actran Aero Acoustics

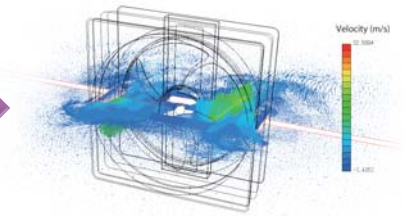
Acoustic Analysis Case Study

1. Perform fluid analysis using SC/Tetra

Specifications	Details
Turbulence model	LES
Time step	1.39 x 10^{-5} [s]
Analysis time	0.04 [s]
Number of rotations	1,500 RPM
Number of blades	5

Analysis model: ventilation fan

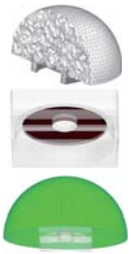
Domain of CFD analysis



CFD analysis results (velocity vector)

3. Generate sound source data using Actran Aero Acoustics

Types of mesh elements used for acoustic analysis

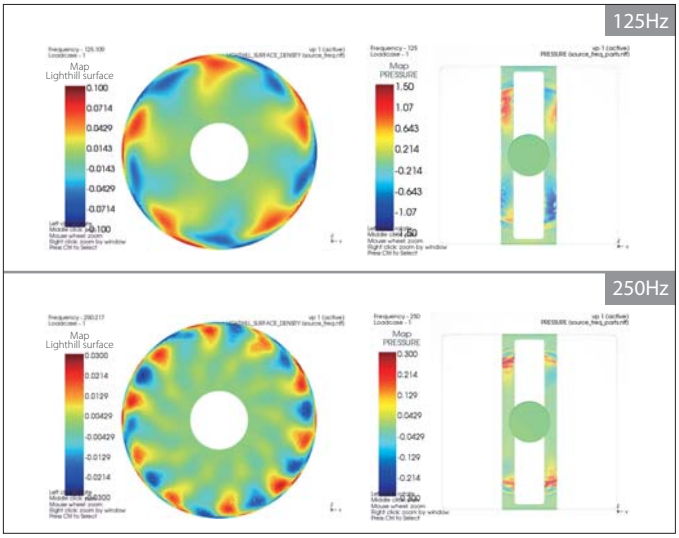


(a) Air elements in the stationary region

(b) Surface elements at the boundary plane between rotating and stationary regions

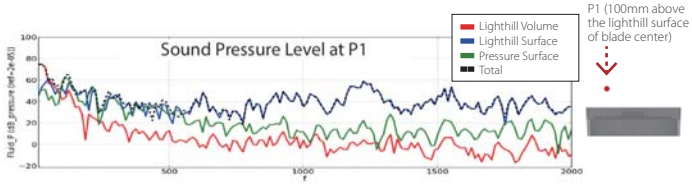
(c) Surface elements at the air domain boundary
➔ Infinite elements
(Non-reflecting boundary elements)

Sound source	Definitions
Lighthill volume	Sound source generated from eddies within the stationary region
Lighthill surface	Sound source within rotating region (defined at the boundary planes between the rotating and stationary regions)
Pressure surface	Sound source generated by pressure fluctuations on solid surfaces in the stationary regions

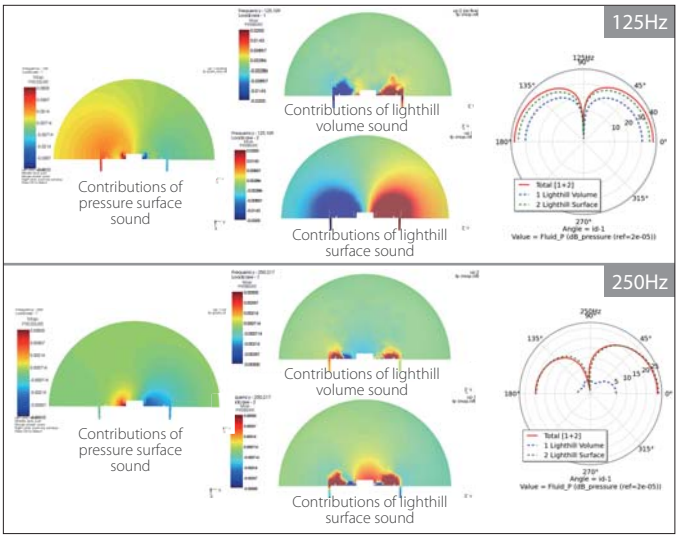


Sound sources generated using CFD results:
sound source of lighthill surface (left) and pressure surface (right)

4. Perform acoustic analysis using Actran Aero Acoustics



Frequency characteristics of noise



Sound pressure distributions (left) and directivity chart (right) for two frequency levels

Results Based on the results of fluid analysis using SC/Tetra, characteristics and effects of each noise were successfully identified by acoustic analyses using Actran Aero Acoustics.