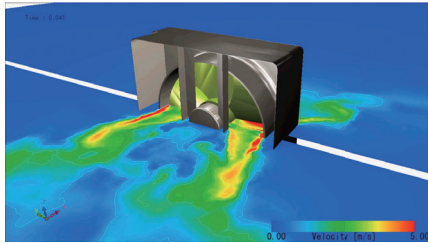


Fan Noise Analysis using scFLOW and Actran

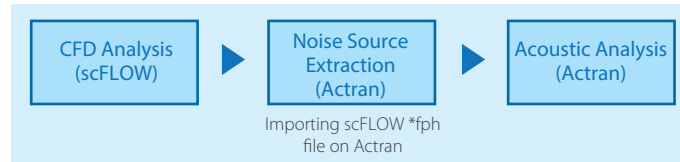
scFLOW Case Study

Accurately predicting fan noise by coupling scFLOW and Actran

Workflow of Acoustic Analysis of Axial Fan



CFD analysis is performed to predict the sound source, which is then used for acoustic analysis. This method is called splitting method and is widely applied in the field of fluid-acoustic analysis.



CFD Analysis (scFLOW)

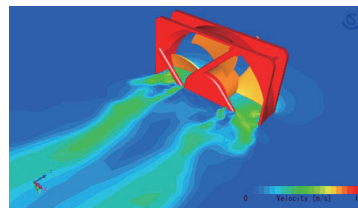
Analysis model

Rotation: 3300 [rpm]
Diameter: 111 [mm]

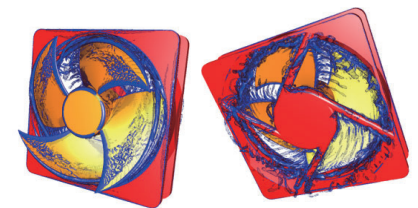


Analysis results

LES transient analysis: WALE model
Time step: 0.25 [degree/cycle]
Number of mesh elements: Approx. 28 million
Size of mesh elements near blades: 0.2 [mm]



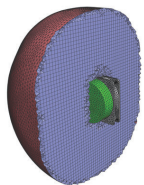
Analysis results (velocity distribution)



Visualization of vortices (second invariance of velocity gradient tensor)

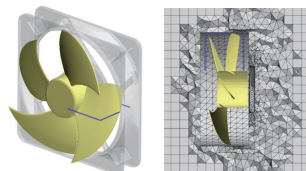
Acoustic analysis (Actran)

Analysis model



Mesh: 200,000 nodes
Maximum frequency: 4Hz
Fourier transformation: 0-4Hz (13.75Hz span)
Calculation time: 2 min 30 sec per frequency

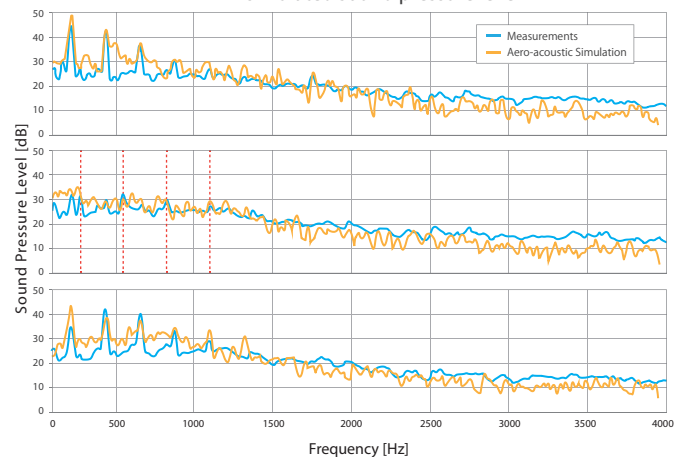
Domain of fluid noise



Extracting data of rotation domain from scFLOW to use it as noise source for acoustic analysis

Analysis results

Comparison between measured and simulated sound pressure level



Notes

- Coupling analysis can easily be performed as scFLOW data can be directly used on Actran
- Accurate and reasonably fast CFD simulation is possible by splitting method
- Coupling analysis using scFLOW and Actran enables fan noise prediction and comparison between different models.