SC/Tetra

Cradle
MSC Software Company

Improving Fan Efficiency with CFD Application

Case Study for Panasonic Ecology Systems Co., Ltd.

Verifying static pressure efficiency and fan characteristics by using SC/Tetra

Utilization of CFD Software in Fan Design

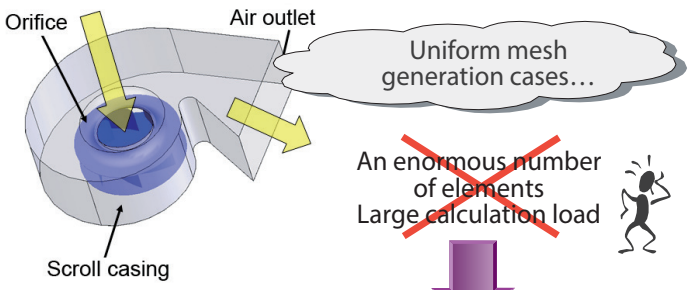
CFD software can be a highly effective tool to improve fan efficiency. In CFD simulations, engineers can see the generation of vortices by visualizing the flow field around fan blades, and estimate the efficiency of the fan from the calculation results on static pressure and torque.

Simulation model

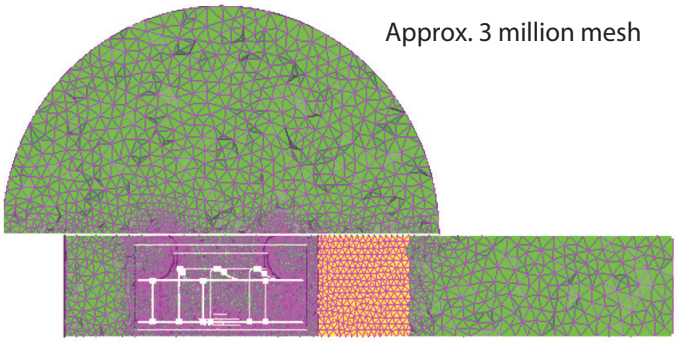
Key point: To create a fan model with enough accuracy required for performance evaluation within a practical range of computational load.

1. With a scroll casing:

A non-axisymmetric model. The entire perimeter of impellers is required for its analysis range transient analysis because performance of the fan is significantly influenced by geometry of the scroll casing and by positions of the blades.



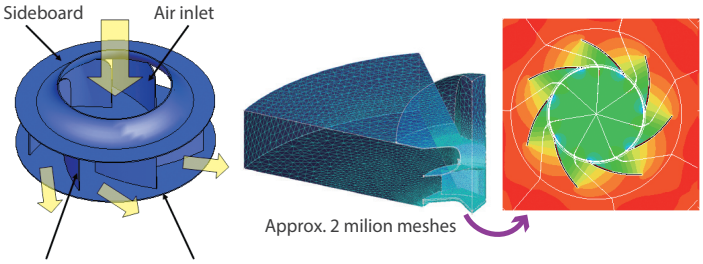
Heavily affected regions — Fine mesh
Less affected regions — Coarse mesh



Decrease computation time & maintain accuracy

2. Without a scroll casing:

A flow path between each axisymmetric blade is assumed to be same, and the flow circulation is periodically repeated.



Calculate the flow path and the blade

Copy the result for the entire figure

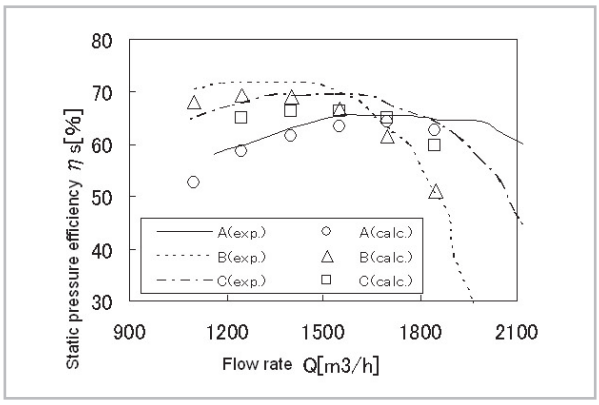
Comparison of results

[Without a casing]

Three types of centrifugal fans with different dimensions are compared.

	Model (A)	Model (B)	Model (C)
Fan diameter	229 mm	229 mm	229 mm
Blade inner diameter	142 mm	156 mm	156 mm
Blade thickness	62 mm	62 mm	82 mm
Orifice height	29.5 mm	39.5 mm	39.5 mm

Approx. 2 million mesh, k-eps model



Maximum Static Pressure Efficiency (B) > (C) > (A)

Air Capacity at Best Efficiency Point (A) > (C) > (B)

Showing simulation curves consistent with experiment

The consistency is also confirmed for the casing types

Customer Comments

A suitable CFD simulation model of the fan is used to identify effective parameters for improving fan's efficiency. Reduction in power consumption of fan has always been one of major challenges.

While high performance computing is growing fast, developers of high-efficiency fans count on CFD applications for complicated analyses.