GridgenApp

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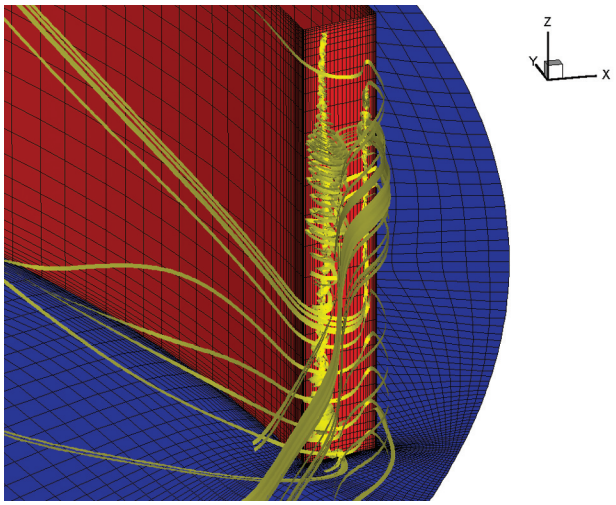
Gridgen Reliable CFD Meshing

Numerical Analysis of Flow Behavior in Radial Blower



Vortices at blade trailing edge

Institute of Turbomachinery researchers at the University of Essen in Schuetzenbahn, Germany have been using Gridgen in their numerical studies of flow behavior in the radial blower of a vacuum cleaner. Dipl.-Ing Uwe Maatje and Prof. Dr.-Ing. E. von Lavante chose Gridgen for this study because grids of good quality were essential to modelling the complex geometry and unsteady flow behavior of the blower. They used Fluent Version 6 as their flow solver.

The radial fan and its modifications considered in the study were also investigated experimentally. In the current three-dimensional study, special attention was paid to details of the flowfield with emphasis on secondary flows and unsteady effects.

To achieve structured grids of good quality, Gridgen's elliptic grid generation techniques were used with the Lavante-Hilgenstock-White (L-H-W) and the Steger-Sorenson (S-S) foreground control functions to ensure grid lines were orthogonal to walls and had the proper spacing for accurate viscous resolution. Both foreground control methods in combination with the Thomas-Middlecoff background control functions led to smooth grids that converged quickly and provided accurate answers in Fluent.

At the blunt trailing edge of the blade, two rows of vortices can be seen shedding from the suction and pressure surfaces. Downstream they form a Von Karman vortex street. Additional unsteadiness in the flowfield in this region is caused by the nearby presence of a fixed stator, which the rotor passes as it rotates.

The grid for this study contains approximately one million hexahedral cells. The configuration consists of three parts: an intake pipe, the rotor and a stator. The aim was to optimize the flow in the rotor in regards to the overall efficiency and minimum noise development, both important design factors for a vacuum cleaner. Several different shapes of the rotor and stator were investigated before determining an optimized design. Because of the high quality grids generated using Gridgen, the researchers were able to analyze the flowfield in detail, obtain favorable comparisons with experimental data, and reach an optimized design.

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