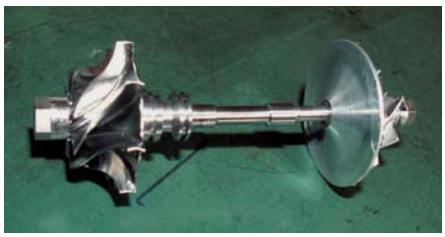
Turbocharger Analysis

Case Study for ACR Co., Ltd.

Minimize prototyping by analyzing turbocharger vane geometry using SC/Tetra

Analysis Objective

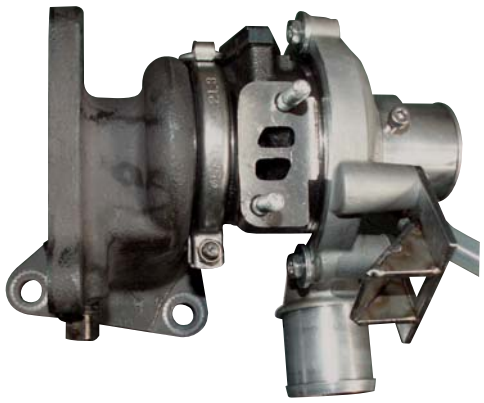
Improve efficiency by reducing the turbocharger gas flow rate to one third the value used in the world's smallest turbocharger found in Japanese Kei minicars.



Turbine rotor

Product

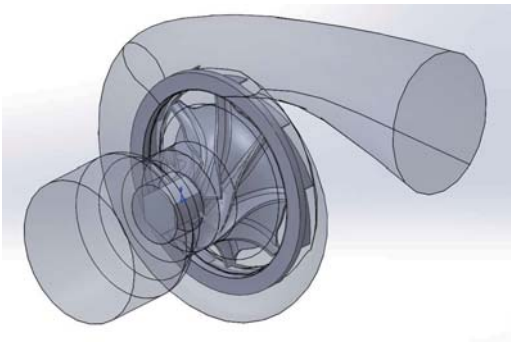
A mini turbocharger for a small, single-cylinder auxiliary power generation diesel engine used to extend the range of electric vehicles.



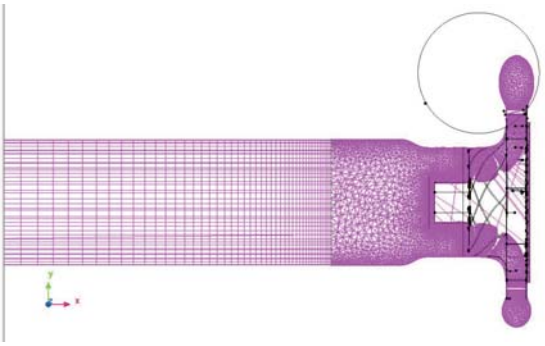
Turbocharger exterior

Analysis model

Geometry A



Meshing

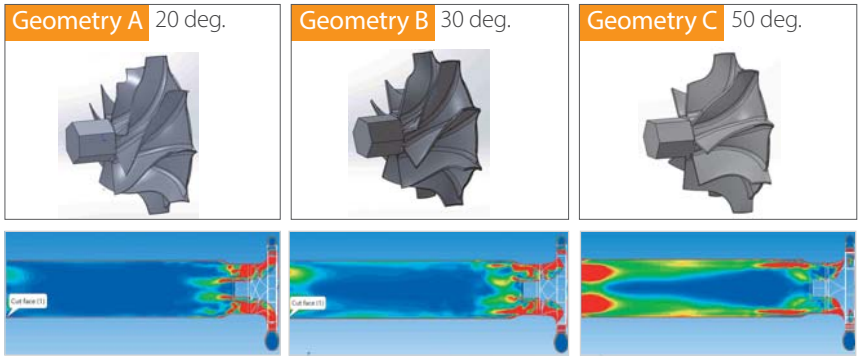


Total number of elements: 6,143,065

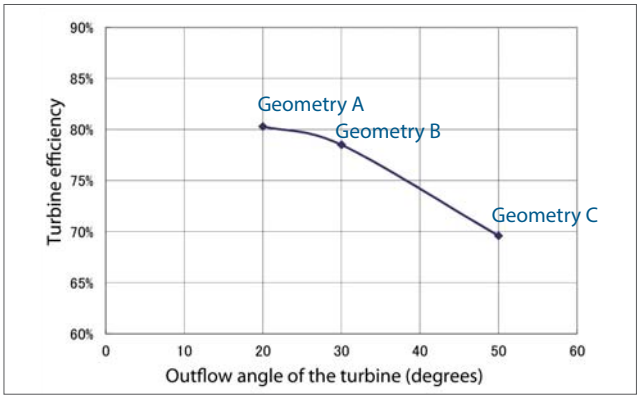
Analysis results

Rotational speed: 200,000 rpm

CFD analysis was used to optimize the rotor vane outflow angle.



Contour of shear heat



Efficiency as a function of rotor vane outflow angle

Customer Comments

Prototyping new geometry for a turbocharger is costly and time intensive. We were able to optimize the vane geometry for maximum efficiency by using CFD analysis. SC/Tetra was used for the CFD calculations. We will make prototypes based on the analysis results and test them to assess performance. Perhaps additional efficiency improvement will be possible. Ultimately we will match this turbocharger with an engine to boost the flow rate and extend range. This product will be ready to market very soon.