# DESIGN AND AERODYNAMIC OPTIMIZATION OF AN AUTOMOTIVE AXIAL FLOW FAN

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This project concerns the optimisation of a "3D Cooling Fan System" for automotive applications.

Special attention was given to the performance improvements of shrouded rotor blades obtainable by mean of an optimization system based on Genetic Algorithms (GA), Artificial Neural Network (ANN) and 3D Navier Stokes solver (NS). Consequences of the stacking on the aerodynamical fan behaviour were investigated.

The inputs of the project were the 2D airfoils and 3D model of the actual cooling fan, the specification to be achieved at the design point and the dimensional restrains of the system.

After an accurate examination of the current fan system and a review of the available experimental data, the project was devoted to the 2D design of a fan according to the specification. The following step was to evaluate the implementation of a CAD system in the optimization process. 2D parametric airfoils and 3D parametric blades were designed and aerodynamic analyses were conduced on both the 2D and 3D geometries.

Next step was to model the base line 3D model and create a performance map. Once the boundary conditions at the design point were defined, a database with 46 samples was created.

Validating the CFD solver, analysing the database results, defining the improved rotor blade and proposing solution for future development concluded this work.

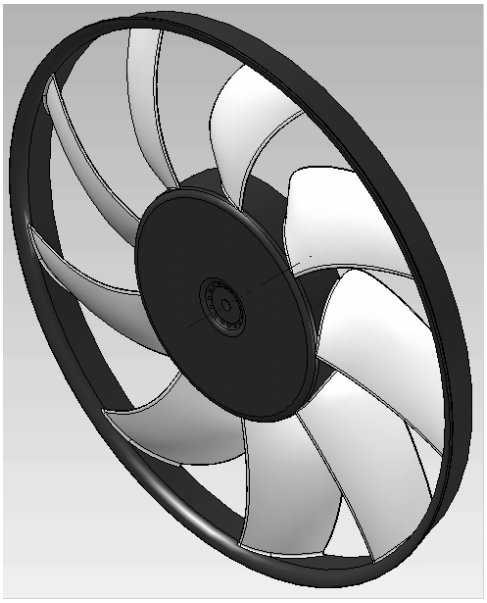

*Figure 1: Shrouded fan*

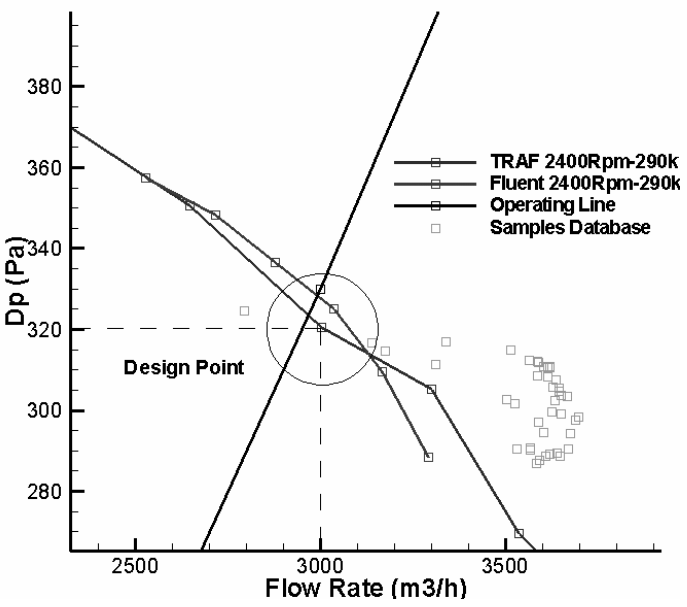


*Figure 2: Performance Map*