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[Home](#) > Development of Optimization Techniques for the Design of an Internal Combustion Engine Airbox

Development of Optimization Techniques for the Design of an Internal Combustion Engine Airbox

The geometrical design of the airbox for an internal combustion engine has a significant effect on the pressure loss in the entire inlet tract. Due to the location of the airbox, its size and shape is usually limited as a result of the proximity to other under-bonnet features. The shape is also limited by manufacturing, assembly and NVH considerations. The complexity of the unsteady flow through the airbox and the constraints placed upon it by the available volume in the under-bonnet area make this a challenging design task. This paper reviews the current thinking on methods used to optimize Computational Fluids Dynamics (CFD) problems and how this would apply to the optimization of an airbox for an internal combustion engine. The paper then goes on to detail the findings of the initial validation work on the CFD method for predicting the pressure loss through an airbox. An optimization case study is then presented based on one of the models used for the validation.

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