

Reduction of Aerodynamic Drag Using Vortex Generators

Authors : Siddharth Ojha, Varun Dua

Abstract : Classified as one of the most important reasons of aerodynamic drag in the sedan automobiles is the fluid flow separation near the vehicle's rear end. To retard the separation of flow, bump-shaped vortex generators are being tested for its implementation to the roof end of a sedan vehicle. Frequently used in the aircrafts to prevent the separation of fluid flow, vortex generators themselves produce drag, but they also substantially reduce drag by preventing flow separation at the downstream. The net effects of vortex generators can be calculated by summing the positive and negative impacts and effects. Since this effect depends on dimensions and geometry of vortex generators, those present on the vehicle roof are optimized for maximum efficiency and performance. The model was tested through ANSYS CFD analysis and modeling. The model was tested in the wind tunnel for observing its properties such as aerodynamic drag and flow separation and a major time lag was gained by employing vortex generators in the scaled model. Major conclusions which were recorded during the analysis were a substantial 24% reduction in the aerodynamic drag and 14% increase in the efficiency of the sedan automobile as the flow separation from the surface is delayed. This paper presents the results of optimization, the effect of vortex generators in the flow field and the mechanism by which these effects occur and are regulated.

Keywords : aerodynamics, aerodynamic devices, body, computational fluid dynamics (CFD), flow visualization

Conference Title : ICAMAME 2018 : International Conference on Aerospace, Mechanical, Automotive and Materials Engineering

Conference Location : Mumbai, India

Conference Dates : February 22-23, 2018