

A Parametric Study on Aerodynamic Performance of Tyre Using CFD

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Abstract : Aerodynamics is the most important factor when it comes to resistive forces such as lift, drag and side forces acting on the vehicle. In passenger vehicles, reducing the drag will not only unlock the door for higher achievable speed but will also reduce the fuel consumption of the vehicle. Generally, tyre contributes significantly to the overall aerodynamics of the vehicle. Hence, understanding the air-flow behaviour around the tyre is vital to optimize the aerodynamic performance in the early stage of design process. Nowadays, aerodynamic simulation employing Computational Fluid Dynamics (CFD) is gaining more importance as it reduces the number of physical wind-tunnel experiments during vehicle development process. This research develops a methodology to predict aerodynamic drag of a standalone tyre using Numerical CFD Solver and to validate the same using a wind tunnel experiment. A parametric study was carried out on different tread pattern tyres such as slick, circumferential groove & patterned tyre in stationary and rotating boundary conditions. In order to represent wheel rotation contact with the ground, moving reference frame (MRF) approach was used in this study. Aerodynamic parameters such as drag lift & air flow behaviour around the tire were simulated and compared with experimental results.

Keywords : aerodynamics, CFD, drag, MRF, wind-tunnel

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