ABSTRACT

The effect of design guidelines on aerodynamics was not of prime importance in the past, but with the increased concern about future availability of fuel, fuel economy becomes an important requirement expected of a modern car or utility vehicle. Fuel consumption depends, among other factors, on the aerodynamic drag of the vehicle.

The research undertaken deals with an experimental determination of C_D (drag coefficient) for Hyundai, Pajero, Toyota, SNVI mini-bus, and Mercedes SEL 300 models with scales of 1/30, 1/30, 1/20, 1/40 and 1/20 respectively by using the strain gauge method (FLA-6-11 type, 120Ω, 2.12 gauge factor, half-bridge connection) which was proved to be practical and reasonably accurate.

Experiments were run within a subsonic aspiration wind tunnel, covering an air speed up to 33m/s(Reynolds number up to $6.55x10^5$). Drag coefficients of 0.39, 0.34, 0.27, 0.68; and 0.19 for Hyundai, Pajero, Toyota, SNVI mini-bus, and Mercedes SEL300 were obtained respectively. Comparison of our results with those given by other authors is satisfactory.

From the visualisation point of view it can be noted that a key feature of the flow field around a vehicle are the regions of separated flow, so, smoke experiments around the pre-quoted models with qualitative description about flow visualisation for each type (Hyundai, Pajero, Toyota, SNVI mini-bus, and Mercedes SEL300) in subsonic wind tunnel at 35m/s have been accomplished.

On the other hand, the complexity of aerodynamic characteristics of a vehicle affects its handling through aerodynamic lift and side wind stability. For this respect, we have carried out an analytical study of the side wind effect on the amplitude ratio for the passenger car. Results show that at $f < 1.0$, an amplitude ratio of the vehicle was subjected to great changes on its profile with respect to vehicle speed, while at $f \geq 1.0$, there is no obvious difference in amplitude ratio in each case(with and without side wind effect).