

Comparison Report to show Drag Force on 3 Roof Bar Designs for Van Guard

Summary

Van Guard required an independent report showing how their new roof bar product compared against 2 competitor designs currently in the market.

To do this, the drag force from each roof bar travelling in a head-on wind of 70mph was calculated using the CFD software package (Computational Fluid Dynamics) SolidWorks Flow Simulation 2013 SP3.

A lengthy initial feasibility study was conducted to establish what parameters of the software would be needed to produce acceptable results. From this, the drag force on each design was then obtained to within a reasonable degree of accuracy.

The independent results showed that Van Guard's new design gave on average 89% less drag than their nearest competitor.

Preliminary study

Before a detailed comparison could be conducted, a preliminary study needed to be carried out to verify what the acceptable input parameters of the software should be in order to have confidence in the results.

To do this, several initial simulations were run with various settings.

Another part of this study was to ensure the computational domain was large enough to fully capture the correct behaviour.

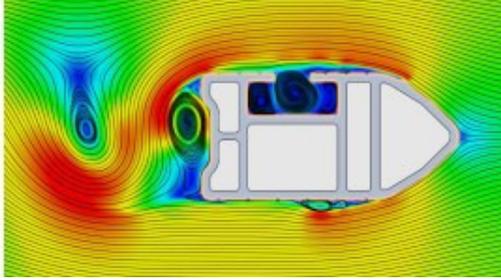
To simplify the analysis, a 2D simplification was used. This was acceptable due to the extruded nature of the roof bar profiles.

Comparison study

Once the ground work had been covered and a confidence in the model set-up achieved, a comparison study for the different designs was undertaken.

Results

The comparison study showed the new Profile gave the best drag results.



The next nearest competitor gave nearly nine tenths more drag (89%). The worst design was the square section which produced almost double the drag for the new Profile.

Limitations and scope of the work

Neither the van on which the roof bar component is attached nor the attachment brackets were considered. The study set-up only measured 1 head-on wind direction; the direction ordinarily associated to the direction the vehicle is travelling in. While this may have some bearing on the realistic drag force conditions in service (i.e. the path of the oncoming air may be affected by including the van roof), the impact of this and similar conditions are of little interest as the main purpose of the report is to compare different roof bar designs on a like-for-like basis.