Assessing the Performance of Heavyweight Vehicles using Adams

Using Adams Car, the engineering team at Smedley’s Engineers could precisely determine the manoeuvrability of a heavyweight vehicle.

Adams Car gave Smedley’s Engineers the freedom to envision and configure vehicles without the restriction of template availability

The automotive industry has made some great strides over the last few decades. Most vehicles sold today have excellent handling and manoeuvrability, compared to their predecessors. However, heavyweight vehicles are typically considered more difficult to manoeuvre. In principle, there is no limit on the number of axles, articulation points, and types, castor steering, non-linear suspension characteristics, etc., that a vehicle can possess. It is also possible to simulate features such as fifth wheel lash and dynamic fluid slosh. Engineers can choose the complexity level of the simulation parameters as required.

Smedley’s Engineers was facing challenges since the vehicle dynamics packages that it were using offered only template-based vehicle configurations. Therefore, the team could only simulate their vehicle combinations if the software provider offered a similar vehicle template. Given the rapidly changing field in Australia’s heavy vehicles industry, the team needed to freedom to envision and configure vehicles outside of those currently in service.

Overcoming Simulation Challenges using Adams

With MSC Adams Car, the team could quickly and efficiently configure large multi-combination vehicle models, such as 60m road trains with eight or more vehicle units, each with multiple axles. The software also allows quick duplication of vehicle units by copying sub-systems. In addition, the Smedley’s Engineers team uses Adams to meet requirements as per the Australian Performance Based Standards (PBS) scheme for heavy vehicles.
Virtual Tyre Testing to Achieve Parameter Parity

In any vehicle, the tyre design plays an important role. Most players in the Smedley's Engineers industry ecosystem were conducting physical tests on tyres, leading to incorrect tyre data since it is based on inconsistent standards and test parameters.

With the Adams Tyre Fit Tool (TFT), the engineers could build a virtual tyre. They could extrapolate the tyre characteristics beyond the tested range of the tyres to include parameters such as inflation pressure, vertical load, slip angle, camber angle, etc. The TFT allows multi-parameter parity comparisons between different tyres.
Enhanced Maneuvering Capabilities in the Future

Smedley’s engineers have been using Adams car now for over a year to simulate how heavy vehicles perform when subjected to a range of maneuvers such as for a severe lane-change, roll-over, yaw damping, and swept path assessments.

Based on their experience with using at least three other different vehicle modelling packages, engineers at Smedley’s found MSC Adams to be the most powerful and flexible tool, without compromising on the time to set up models.

Given the favorable experience with Adams, the engineering team is also exploring the use of other MSC products for FEA analysis. One area that they are interested in is trailer tow coupling or kingpin for trailers. While Adams Car can help identify these forces, Finite Element Analysis (FEA) analysis could be conducted using MSC Apex or MSC Nastran.

The capability of tying-in with the Adams vehicle simulation software with MSC’s other FEA products is a big plus. For instance, force outputs from Adams can be fed directly into the sub-system FEA analysis of components. This allows for chassis and coupling stress analysis that is specific to an individual vehicle, road topography, and maneuver.
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