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How to parameterize a vehicle model for correlation with a coast down test?

Here, we explain how a vehicle model can be parameterized with the help of the CarMaker Add-on "Coastdown Adaption" so that it correlates with realworld coast down tests. To achieve a correlation regarding the resistance force, the tool adjusts several parameters automatically. Based on this adaption, a new TestRun, vehicle and tires are created, which can be used for the coast down test in CarMaker.

Technical Background

Coast down is a frequently used test for vehicles to determine and evaluate the values of resistant forces (e.g. aerodynamic drag, rolling resistance) acting on the vehicle at a specific speed under specific road conditions**.** The Coastdown Adaption tool was designed for powertrain applications to identify a set of parameters which have direct impact on the resistance force in order to achieve similar simulation results like with the corresponding real vehicle. It comes with a graphical user interface for the parameterization and uses inbuilt TestRuns to compare the resistance force of measurement and simulation. Certain parameters are adjusted automatically to achieve the given resistance. The output is a new vehicle dataset with adjusted resistance comparable with the realworld coast down measurement.
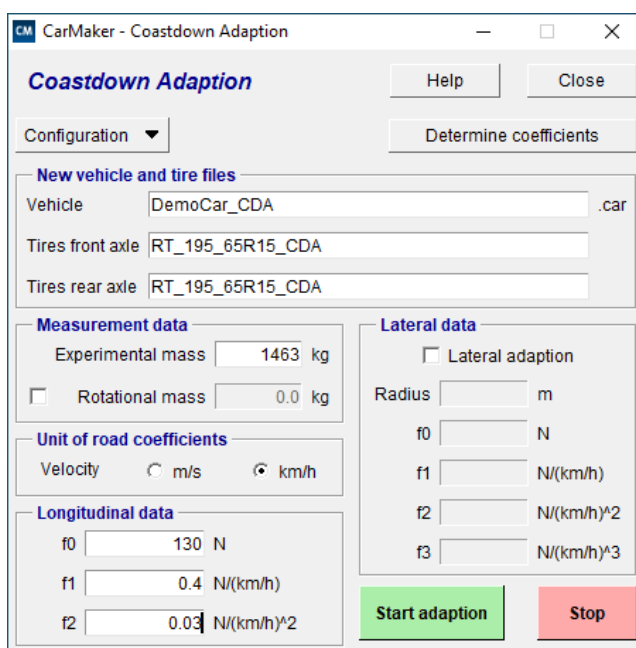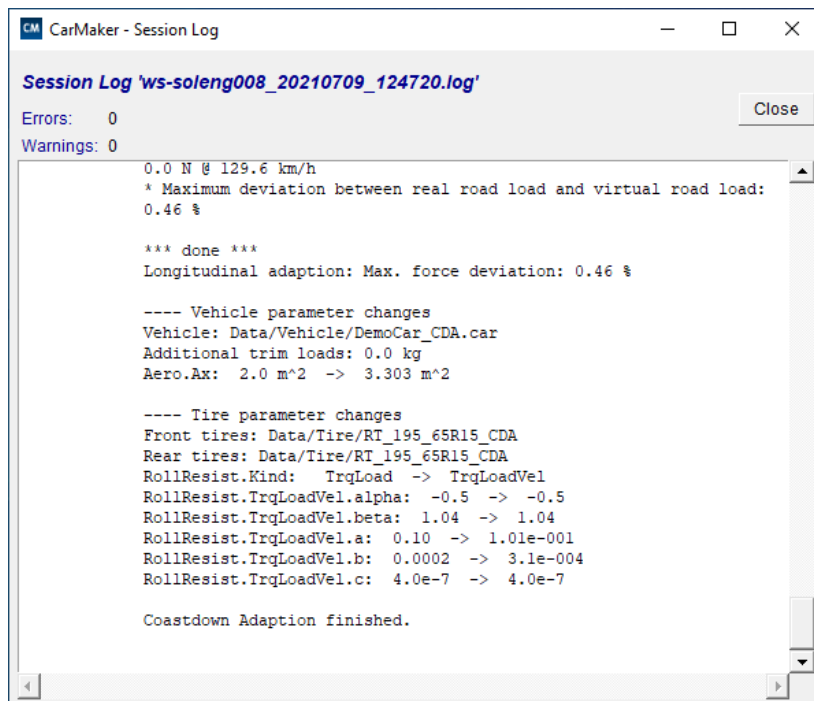

Fig. 1: GUI of the Coastdown Adaption tool with example parameters for the DemoCar.

Solution

The Coastdown Adaption tool starts with a vehicle dataset that is selected by the user like in any other TestRun in CarMaker. In case you don't have an appropriate dataset in your database use the vehicle data set generator to create one first (see CarMaker Users Guide for more information). A copy of the vehicle and the tires will be made anyways in order to maintain the original data set. During the Coastdown Adaption, the tool automatically switches the rolling resistance model of the tire to a load and velocity dependent model (according to SAE J2452). It also adjusts the parameters for tire and aerodynamics of the vehicle to achieve the correct resistance. Additionally, a cornering coast down test can be performed to adjust the resistance in corners. As the resistance in the corner depends on the kinematics and suspension setup, a simplified approach is used which is limited to a cornering stiffness factor that is adjusted.

If you run the Coastdown Adaption tool with the parameters from Fig. 1 in combination with the DemoCar from the example folder, the following output will be shown in the Session Log. Here you can find further information regarding the adapted parameters.

Fig. 2: Session Log output during the Coastdown Adaption.

For additional information about the Coastdown Adaption tool in general and how to use it properly, please have a look at the documentation which is included in the .zip package.

Disclaimer:

The tool was designed to support engineers working with coast down measurements in the area of powertrain development and gives good confidence for longitudinal dynamics. It is not meant to be used for a full vehicle parameterization.