Skid against Curb simulation using Abaqus/Explicit

Dipl.-Ing. A. Lepold (FORD), Dipl.-Ing. T. Kroschwald (TECOSIM)

Abstract: *Skid a full vehicle against a curb in lateral and longitudinal direction are two out of several tests to proof the strength of a suspension. Knowing the internal forces acting on suspension components during such an event is extremely important for being able to dimension safety critical parts correctly. Measuring these loads is an elaborate task, because the use of wheel force transducers is not possible due the risk of damaging them. It is necessary to apply strain gauges and force cells instead.*

Therefore the possibility of a fully virtual approach using Abaqus/Explicit would be of great value. A Mc Pherson front suspension has been used as an example to demonstrate :

- *Retrieving internal suspension forces*
- *Verifying the "Chain of Failure"*

for a STUDY to virtually "Skid a Vehicle against a Curb" in longitudinal direction. Correlation with actual force measurements will reveal the potential as well as the restrictions of using such an approach for load prediction and verification.

Furthermore an attempt will be made to transfer the full vehicle impact tests / simulations to suspension level testing. Both a suspension impact rig as well as a simple static suspension strength rig will be set up in the real and the virtual world.

Keywords: *Collapse, Impact, Multi-Body Dynamics, Suspension, Tires, Strength Event, Load Prediction*

1. Introduction

Different car manufacturers conduct strength tests for their vehicles traditionally with different setups. Qualitatively these strength events look quite similar :

• Longitudinal and vertical overload : "Drive over Curb"

• Longitudinal and lateral overload : "Skid against Curb"

The differences lie within the chosen parameters for curb height, vehicle loading, speed, etc. Also the suspension settings, e.g. sportive versus comfortable have a quite significant influence on the level of forces generated internally in the suspension.

These force levels are used to distinguish between different classes of strength events. Mainly three classes of events have been defined as shown in Figure 1.