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REAR SUSPENSION DEVELOPMENT: DURABILITY STUDY ON THE EFFECTS OF VARIATION OF VEHICLE AND SUSPENSION CHARACTERISTICS IN A TWIST BEAM REAR SUSPENSION

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ABSTRACT

Through the use of finite element models of full vehicles and digitized proving ground tracks is possible to generate durability load time histories at the early stages of a project, providing reliable data to evaluate critical components such as the rear suspension since the beginning of a development. However, during the vehicle design, optimization of vehicle and suspension characteristics to suit customer desires, fuel efficiency targets and ride and handling performance is a continuous process. This optimization process affects the durability loads generation, affecting the vehicle durability. This study aims to evaluate the effect of these vehicle and suspensions characteristics changes in a twist rear beam suspension durability.

Keywords: durability, fatigue, rear suspension, load generation, twist beam suspension.

INTRODUCTION

During a vehicle design, the durability loads definition is one of the key inputs for a correct development. The numerical loads generation technique allows the creation of durability load cycles in various design stages. During the course of the project, vehicle and suspension characteristics are optimized according with target's needs. These changes can modify the loads generation, by altering the way that the loads are transmitted and absorbed by the suspension and the vehicle body. An initial sensitivity analyses can indicate which of the characteristics have the biggest effects on the loads generation and, consequently, on the rear suspension durability.

A full vehicle finite element model is used to generate the durability load cycle by using a series of digitized tracks of a durability proving ground simulating a full durability schedule. Figure 1 shows three of the digitized tracks. This first data is used as an input in a finite element rear suspension fatigue analysis. This first analysis will be used as a baseline result. The critical fatigue areas for the rear suspension will be defined and the most damaging tracks for these specific areas will be selected and used in the subsequent analyses.

Vehicle and suspension characteristics, such as centre of gravity height, wheel and tire sizes and pressure, bumper and spring stiffness and rear suspension torsional stiffness will be evaluated regarding their effects on the rear suspension durability through sensitivity analyses. A series of full vehicle models considering changes in these characteristics will be

created through a DOE, and the loads generation for the most damaging tracks for each one will be generated.

These analyses will allow the critical parameters identification for the rear suspension durability. This is an important knowledge that will assist in the correct development of a rear suspension since the early stages of the project.

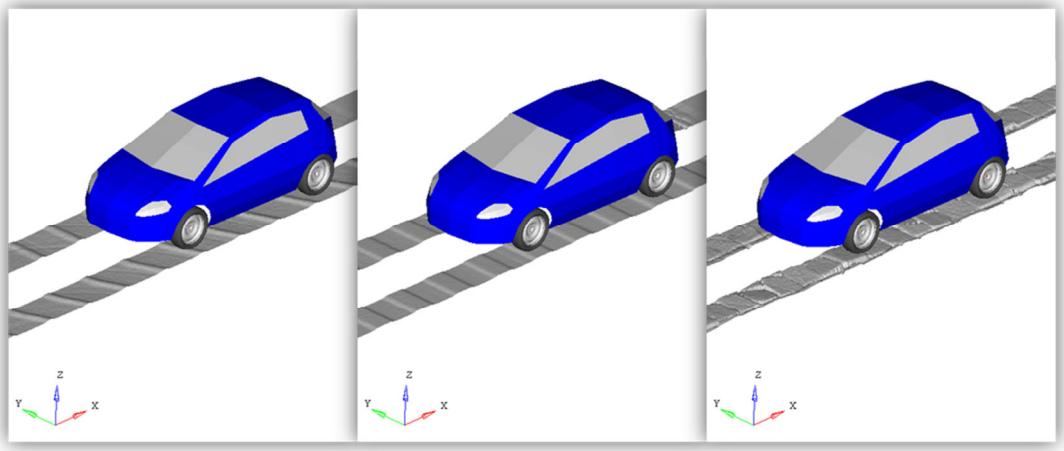

Fig. 1 - Digitized Proving Ground Tracks

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