

Material Characterization and Numerical Simulation of a Rubber Bumper

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Abstract : Non-linear FEM calculations are indispensable when important technical information like operating performance of a rubber component is desired. Rubber bumpers built into air-spring structures may undergo large deformations under load, which in itself shows non-linear behavior. The changing contact range between the parts and the incompressibility of the rubber increases this non-linear behavior further. The material characterization of an elastomeric component is also a demanding engineering task. In this paper, a comprehensive investigation is introduced including laboratory measurements, mesh density analysis and complex finite element simulations to obtain the load-displacement curve of the chosen rubber bumper. Contact and friction effects are also taken into consideration. The aim of this research is to elaborate an FEM model which is accurate and competitive for a future shape optimization task.

Keywords : rubber bumper, finite element analysis, compression test, Mooney-Rivlin material model

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