

Finite Element Analysis of Ball-Joint Boots under Environmental and Endurance Tests

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Abstract : Ball joints support and guide certain automotive parts that move relative to the frame of the vehicle. Such ball joints are covered and protected from dust, mud, and other interfering materials by ball-joint boots made of rubber—a flexible and near-incompressible material. The boots may experience twisting and bending deformations because of the motion of the joint arm. Thus, environmental and endurance tests of ball-joint boots apply both bending and twisting deformations. In this study, environmental and endurance testing was simulated via the finite element method performed by using a commercial software package. The ranges of principal stress and principal strain values that are known to directly affect the fatigue lives of the parts were sought. By defining these ranges, the number of iterative tests and modifications of the materials and dimensions of the boot can be decreased. Therefore, instead of performing actual part tests, manufacturers can perform standard fatigue tests in trials of different materials by applying only the defined range of stress or strain values.

Keywords : boot, endurance tests, rubber, FEA

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