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Fatigue analysis of the welded region in the automotive torsion beam rear suspension system

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ABSTRACT

Torsion beam rear suspension systems have been widely used in small passenger vehicles owing to their compactness, light weight, and cost efficiency. This system often comprises several components welded together. In general, welding leads to local stress concentrations, residual stresses, and various types of defects. In the design stage, durability evaluation of welded joints is one of the major concerns to be considered. In this study, the deformation and strain distribution in the vicinity of the welded region were measured by digital image correlation method (DIC). The results were compared with the simulation of finite element method and durability analysis. Both the rig test and simulation results indicate that cracks might occur at the weld seam between the spring seat and torsion beam. Meanwhile, enhancement testing was performed on the proving ground and the crack location coincident with the predicted results. In this study, with the help of fatigue simulation and the DIC method used in the rig test, cracking location in road test can be predicted in the early stage of vehicle research and development process.

KEYWORDS: fatigue, weld, digital image correlation method (DIC), finite element method (FEM), crack, automotive