

Improvement in the Ride Behaviour of a SUV by Changing the Suspension Parameters



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Abstract:

Quality of ride in a vehicle describes the comfort of an occupant. The level of comfortness varies from vehicle to vehicle. Ride characteristics in a vehicle depend on the suspension system, which includes springs, dampers and linkages. Ride is objective as well as subjective. Objective ride is analysed through laboratory test and road test. In the present work ride characteristics of an SUV is analysed through multi-body dynamic simulation and road tests and an improvement of ride characteristics is achieved by varying suspension stiffness.

An SUV was modelled using Adams/Car for dynamic simulations. The spring characteristics i.e., load versus displacement curve of the SUV was obtained from non-destructive test (NDT). The spring characteristics were then assigned to the MBD model. The bounce frequency of the built SUV model was then found by conducting four post-test in Adams/Car. Physical ride test was conducted on SUV by mounting the accelerometer. Validation of results was carried out by comparing simulation and physical ride test conducted on SUV.

During the four post-test simulations, it was found that the sprung mass natural frequency was 2 Hz, by incorporating the stiffness obtained from NDT and 3.13 Hz obtained from physical ride test. Various combination of spring stiffness was carried out on front and rear suspension to reduce the frequency. The front suspension spring stiffness was increased by 10% than that of tested spring, and rear spring stiffness was increased by 40% than that of the front springs. It was found that sprung mass natural frequency was reduced from 2 Hz to 1.3281 Hz. Hence, this combination shows more reduction in frequency compared to other iterations, as the natural frequency lies within the range of 1 to 1.3 Hz. Hence, it is recommended to decrease the spring stiffness to further improve the ride comfort of SUV by taking handling into the consideration.



Non-Destructive Test



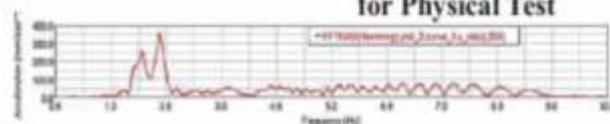
MBD of SUV



Accelerometer Mounting on SUV for Physical Test



Physical Ride Test Frequency



Frequency Before and After Reducing Stiffness