Analysis of Hydro-Pneumatic Suspension System

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ABSTRACT

A heavy off-road land vehicle ’ s safety, ride, and handling are the mainly consideration when exercised in cross-country road. Since the traditional mechanical suspension system need to maintain controllable of vehicle, the driver and passengers have to endure the intense impact from the road. On the other hand, the pursuit of ride will be ignored by safety and handling. To explore a good suspension system installation is very important. This paper adopted hydro-pneumatic suspension system and used double A-arm suspension design institutions to discuss heavy-duty wheeled vehicle. And, this paper utilized Automatic Dynamic of Mechanical Systems (ADAMS), a kind of software for multi-body dynamics, to establish a two-degree-of-freedom (2-DOF) quarter-car dynamic model. Then, input a different frequency stability sine wave to carry observation of the quality of dynamic response, to examine the vertical movement and the frequency domain performance of the hydro-pneumatic suspension system, and to explore the human body vibration on the impact of comfort. Re-use suspension durability testing platform for dynamic experiments, comparison of the vertical movement and acceleration between the actual hydro-pneumatic suspension system components and construction model. Finally, implementation of decompression tests for the nonlinear air-spring of the hydro-pneumatic suspension system, to understand suspension system performance by the pressure of air- spring changes impact. The results showed that the heavy-duty wheeled vehicle using hydro-pneumatic suspension system can reduce the components occupy space of vehicles and perform a more stable condition. It can achieve good results in ride evaluation. In addition, the experimental verification of results of the hydro-pneumatic suspension system ADAMS model is very close to the actual status. Compared with the traditional coil-spring suspension system, the hydro-pneumatic suspension system can reduce the pressure of air-spring to improve riding comfort. The hydro-pneumatic suspension system in this research can be applied in the heavy type vehicles, and it can assemble with semi-active or active control components to increase the suspension performance. The hydro-pneumatic suspension system ADAMS model can expand to whole vehicle modeling, and further forecast the performance of ride comfort and handling.

Keywords : hydro-pneumatic ; suspension ; ADAMS ; ride evaluation

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