Adjustable Valve Semi Active Suspension System for Passenger Car

M. R. Ahmed\textsuperscript{1}, F. R. M. Romlay\textsuperscript{1}, A. R. Yusoff \textsuperscript{2}

\textsuperscript{1}Faculty of Manufacturing Engineering, University Malaysia Pahang 26600, Pekan, Pahang, Malaysia
\textsuperscript{2}Faculty of Mechanical Engineering, University Malaysia Pahang 26600, Pekan, Pahang, Malaysia

*Email: razlan@ump.edu.my

Abstract. The suspension of the car plays a very important role in the safety and the comfort of the vehicle and for absorbing the shock waves and give comfort for the driver and passenger. This paper improves the performance of automobile suspension system, by developing electronically adjustable semi active shock absorber. This achieved by attaching stepper motor for each shock absorber which helps in adjusting the bleed orifice to certain position that alternates the hydraulic oil flow in the shock absorber between piston’s chamber during the process of compression and rebound. To evaluate the effect of developed semi active shock absorber on dynamic behavior of the vehicle, several tests were carried out on different types of road condition (bumpy, straight-line and roundabout). These tests were used to evaluate the acceleration and ride quality. There is great range in response when bleed orifice is opened reached up to 35\% between the stiff and soft setting. The value of root means square acceleration (RMS) was calculated and compared with the standard of human exposure to whole body vibration, which shows slightly error of 6\%. The result shows effect of electronically controllable shock absorber on vehicle’s dynamic behavior. The advantage of electronics to improve performance of ride comfort and reduced the harms due to undesired vibration.

Keywords: Suspension; comfort; controllable; absorbers; softness.

1. Introduction

Ride comfort and road handling have usually been considered the most important factors in evaluating suspension performance. Ride comfort is proportional to the absolute acceleration of the vehicle body, while road handling is linked to the relative displacement between vehicle body and the tires [1-3]. Most automobile suspension systems consist of a damper, a spring and a set of linkages. Those three parts of the suspension system are responsible for varying the resultant absolute acceleration and relative displacement [4]. Spring provides energy storage, the shock absorber is to dissipate energy as a function of its damping coefficient, and the linkages provide mechanism constraints on the suspension and control motion [5]. The shock absorber works as the main component of the suspension system that has a great impact on its performance. Ride quality