

Energy Absorption Characteristic of a Coupler Rubber Buffer Used in Rail Vehicles

Authors : Zhixiang Li, Shuguang Yao, Wen Ma

Abstract : Coupler rubber buffer has been widely applied on the high-speed trains and the main function of the rubber buffer is dissipating the impact energy between vehicles. The rubber buffer consists of two groups of rubbers, which are both pre-compressed and then installed into the frame body. This paper focuses on the energy absorption characteristics of the rubber buffers particularly. Firstly, the quasi-static compression tests were carried out for 1 and 3 pairs of rubber sheets and some energy absorption responses relationship, i.e. $E_{abn} = n \times E_{ab1}$, $E_{dissn} = n \times E_{diss1}$, and $E_{an} = E_{a1}$, were obtained. Next, a series of quasi-static tests were performed for 1 pair of rubber sheet to investigate the energy absorption performance with different compression ratio of the rubber buffers. Then the impact tests with five impact velocities were conducted and the coupler knuckle was destroyed when the impact velocity was 10.807 km/h. The impact tests results showed that with the increase of impact velocity, the E_{ab} , E_{diss} and E_a of rear buffer increased a lot, but the three responses of front buffer had not much increase. Finally, the results of impact tests and quasi-static tests were contrastively analysed and the results showed that with the increase of the stroke, the values of E_{ab} , E_{diss} , and E_a were all increase. However, the increasing rates of impact tests were all larger than that of quasi-static tests. The maximum value of E_a was 68.76% in impact tests, it was a relatively high value for vehicle coupler buffer. The energy capacity of the rear buffer was determined for dynamic loading, it was 22.98 kJ.

Keywords : rubber buffer, coupler, energy absorption, impact tests

Conference Title : ICASMME 2018 : International Conference on Advanced Smart Materials and Material Engineering

Conference Location : Bangkok, Thailand

Conference Dates : December 13-14, 2018