

EXPERIMENTAL RESEARCH OF CHARACTERISTICS OF SHEARING RING

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Abstract

Development of passive safety elements represents one of the most complex fields of mechanical engineering and requires practical and theoretical knowledge equally. A new standard EN15227 directed at railway vehicle structures defines the dimensions and phases of deformation of the end-of-vehicle structure during collision. Serbian railways have many passenger wagons over 20 years old that have no crash elements. These wagons are equipped with a standard buffer in accordance with UIC regulations. The challenge, therefore, is to install crash elements in line with the standard buffer as well as to define a moment when the crash element starts energy absorption. A shrinking tube absorber has the most acceptable absorption characteristics as well as being compact and compatible with the dimensions of standard buffer. In this research, the joint between the standard buffer and the collision energy absorber is a shearing ring designed to break in a specific way at a specific force. The standard buffer is designed to withstand a force of 800 kN without permanent deformation. When the force exceeds this value, the spring in the standard buffer is blocked and the shearing ring breaks, activating the energy absorber. The shearing ring is made from quenched and tempered carbon steel that has passed adequate thermal treatment. Dimensioning of the shearing ring required a series of experiments to determine mechanical characteristics using reduced- and full-scale samples. Final verification of dimensions and working principles of shearing ring was done via collision of two passenger coaches.

Keywords

Passive Safety, Railway Vehicles, Shearing Ring, Experimental Research

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