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FULL-SCALE IMPACT TESTS OF PROTOTYPE OF ENERGY-ABSORBING DEVICE FOR PASSIVE PROTECTION OF LOCOMOTIVE AT COLLISION

Introduction of high-speed passenger traffic and retrofit of the rolling stock are priority lines of the evolution of railway transport. A newly developed locomotive must have the passive safety system that in case of an unavoidable collision provides the transformation of the impact energy into the mechanical work associated with a plastic controlled deformation of the special energy-absorbing devices (EAD). This enables the crash impact to be mitigated and lives of passengers and the train crew to be protected. The paper deals with the pressing problem of the development of the EAD for a high-speed passenger locomotive based on the results of mathematical modeling the EAD plastic deformation in non-standard impacts and the EAD full-scale impact tests (crash-tests) using the EN 15227 European Standard. The paper presents the results of the crash-test of the prototype of the EAD box type with cell packs conducted in the Test Center of TÜV SÜD Rail GmbH (Gorlitz, Germany). The Institute of Technical Mechanics, NANU&SSAU developed the EAD design in cooperation with the MDS Design Production Enterprise. This EAD design has been patented in Ukraine. The objective of the crash-test is to carry out experimental investigations of a plastic deformation of the design under consideration in the impact, to derive the characteristics of the contact forces between the colliding bodies, to estimate the energy-intensity of the EAD prototype. The paper describes scientific and methodical support developed. The results of a finite-element simulation of the crash-test of the EAD prototype are reported. The finite-element model developed has been verified by comparison with the predicted and experimental results using the criteria of the EN 15227 European Standard. The accuracy of the results of numerical calculations made by scientific and methodical support developed has been validated.

Keywords: *passenger train, crash collision, passive safety, energy-absorbing device, crash-test, finite-element simulation.*

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