



ANALYSIS OF FAILURES OF TYPE “Z” FREIGHT WAGONS ON SERBIAN RAILWAYS

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Abstract – The aim of the thesis is to analyze the failures occurring on freight wagons of the "Z" type operating on the Serbian railway network, with a particular focus on identifying critical components and operational conditions that contribute to their occurrence. Based on the obtained results, the thesis seeks to propose preventive measures and maintenance strategies aimed at reducing the frequency of future failures, improving wagon reliability and safety, and optimizing the overall efficiency of freight railway transport in Serbia. "Z" type freight wagons are tank wagons used for the transportation of liquid, powdered, and gaseous substances. To ensure safe transport, proper tank marking and regular maintenance of critical wagon components are essential. The analysis of the collected data showed that the main causes of failure and withdrawal of "Z" type freight wagons from service are technical malfunctions, inadequate documentation and labeling and various types of damage. The most frequently occurring failures are associated with the air brake system, brake distributor and draw-and-buffering devices. Carefully planned maintenance helps prevent failures that could endanger human life and health, cause environmental damage, and disrupt railway operations. The development of predictive maintenance systems is becoming increasingly important because they are based on a proactive approach to maintenance management. These systems are capable of monitoring, recording and predicting the performance of rail vehicles and their individual components. By analyzing the collected data, it is possible to assess the condition of equipment and identify potential failures before they occur. This enables more effective planning of maintenance activities, reduce downtime, and contributes to the safer and more efficient operation of rail vehicles.

Keywords – freight wagons, tank wagons, failure analysis, predictive maintenance, railway safety.

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