Implementing Intelligent Monitoring of the Technical Condition of Locomotive Hydraulic Transmissions

Boris Bondar[1], Oleksandr Ockasov[1], Viačeslav Petrenko[2(✉)], and Michail Martishevskij[1]

[1] Ukrainian State University of Science and Technologies, Lazariana st. 2, 49010 Dnipro, Ukraine
[2] Vilnius Gediminas Technical University, Plytinės st. 27, 10105 Vilnius, Lithuania
viaceslav.petrenko@vilniustech.lt

Abstract. The study is aimed at replacing outdated approaches in the organization of maintenance of the locomotive fleet. The article presents a comparative analysis of maintenance strategies for traction rolling stock. The necessity of introducing control over the technical condition of locomotives to ensure the transition to a preventive maintenance system is substantiated. Directions of research - adjustment of the existing volumes and frequency of repairs, the introduction of individual repair strategies, the introduction of adapted and flexible approaches to the maintenance of locomotives. To improve the efficiency of monitoring the technical condition of locomotives, the use of factor analysis methods is proposed. The purpose of using factor analysis methods is to reduce the number of analysed parameters, while the information content of monitoring the technical condition should not decrease. The results of applying the method of principal components to assess the technical condition of the hydraulic transmission of a diesel locomotive during testing are presented. It is proposed to use the concept of latent diagnostic parameters to assess the technical condition of locomotive units. Considering the physical meaning of the processes occurring in the hydraulic transmission, as a result of the analysis, three groups of latent parameters were identified: "Load", "Losses", "Input". These parameters characterize the technical condition of the hydraulic transmission. Each of the latent parameters includes information from a group of physical process sensors. The implementation of the considered approach will ensure the effective use of monitoring results and a gradual transition to predictive maintenance.

Keywords: Rail vehicle · Hydraulic transmission · Maintenance strategy · Principal components analysis · Latent diagnostic features · Parameter informativeness

1 Introduction

The world's leading transport and industrial companies are investing significant funds in the modernization of approaches to servicing fixed assets. The efficient use of fixed assets