

1. New Bogie for Flat Wagons Designed for High-Speed Container Transportation by Ukrainian Railways

Rostyslav Domin¹, Yurii Domin

pages: 89-96

Summary. The paper is devoted to scientific and technical issues related to the development of a new generation bogie for the equipment of specialized flat wagons designed for high-speed transportation of containers. Based on the analysis of previous research results and main technical requirements, a technical solution for a bogie with an all-welded frame and axle-box spring suspension, provisionally named TFT, has been proposed. According to the estimated strength of the welded frame of the bogie, satisfactory compliance of the stress-strain state of the frame with regulatory requirements was established. By means of computer modelling, the dynamic performance indicators of the container flat wagon with TFT type bogies were determined in comparison with the case of equipping the flat wagon with three-piece bogies of the model 18-100. The corresponding mathematical models were built according to the calculation schemes of wagons as spatial multibody mechanical systems, taking into account the action of dry friction forces in the spring suspension and in the body supports on the bogies. The results of the study indicate significant advantages in terms of both cargo vibration protection and movement safety of the variant of equipping the flat wagon with TFT bogies. A significantly lower level of force action on the track of the flat wagon with TFT bogies was also noted.

Keywords: flat wagon, TFT type bogie, frame strength evaluation, model 18-100 bogie, calculations of dynamic indicators

2. Railways and Iron Metallurgy – Based on the Example of ArcelorMittal's Operations in Poland

Marek Graff

pages: 97-116

Summary. Iron metallurgy is closely linked to railways – the large-scale development of one industry was made possible by the other, and vice versa. The Industrial Revolution, which began in England and Scotland in the 18th century, would not have been possible without steam engines and the discovery of significant hard coal deposits. The development of steam locomotives, which also took place in England at the beginning of the 19th century, made it possible to revolutionise transport – the carriage of passengers and freight. The development of efficient technologies for producing steel in large quantities accelerated the growth of railways, which in turn stimulated industrial development, initially in England and later in France and Germany, altering the face of the European continent. The steel industry in Poland developed in the 19th century, and its growth accelerated after 1945 with the imposition of the communist regime. Currently, steel production has decreased (since 1989), and the majority of ironworks were acquired in 2005 by the Indian conglomerate ArcelorMittal. This meant, among other things, an improvement in production quality – large quantities of crude steel were no longer produced, but rather finished steel products. The modernisation of ironworks in Poland (the technologies applied in the plants established in the 1950s were rather primitive) or, more broadly, the restructuring of the Polish metallurgical industry, meant the closure of the most environmentally burdensome facilities, i.e., an improvement in air quality and the implementation of new production technologies.

Keywords: railways, steel, ironworks, Poland, ArcelorMittal

3. Crisis of the Railway Rolling Stock Industry in Russia

Marek Graff

pages: 117-130

Summary. This article presents the current state of railway rolling stock production in Russia, focusing primarily on locomotives and multiple units manufactured both by the domestic industry and through cooperation with Western manufacturers from Europe and North America. The introduction of economic sanctions following Russia's armed aggression against Ukraine has led to significant declines in the number of vehicles produced; for those already in service, these sanctions have resulted in a lack of access to spare parts. Consequently, the state authorities place an emphasis on manufacturing vehicles utilising indigenous technical design, which is therefore outdated (modern vehicles are produced in rather negligible numbers). For this reason, the process of railway modernisation in Russia has slowed down significantly, and the lack of required investment in the sector will lead to its progressive degradation.

Keywords: railway in Russia, RZD, NEVZ, Ural Locomotives Works, Kolomna Works

4. Modification of Reverse Curves on Railway Lines Using Connecting Curves

Władysław Koc

pages: 131-148

Summary. This paper investigates methods for modifying reverse curves, i.e., a geometric layout consisting of two consecutive circular curves (usually with different radii), curving in opposite directions and directly connected to each other. These curves pose certain operational problems due to abrupt changes in curvature. The distance between the intersection points of adjacent main directions of the route, which cannot be too small, was discussed. On modernized railway lines, this requirement is frequently not satisfied, making it necessary to modify reverse curves accordingly. Three geometrical configurations of reverse arcs were considered. In Layout I, the distance between the main points of the route was significant (i.e., 1000 m).

It was demonstrated that in this case, the standard solution involving the use of circular curves with transition curves could be successfully applied. In Layout II, a limited distance between the main points of the route was assumed (i.e., 400 m).

From the perspective of train speeds, the standard solution did not meet the requirements in this case. Therefore, a curve connecting the two extreme main directions was proposed; this curve satisfies the appropriate boundary conditions and the assumed differential equation. By increasing the length of this curve, higher maximum train speeds can be achieved.

One limitation may be the obstacles that arise, for example, due to the terrain conditions. Layout III is characterized by a short distance between the main points of the route (i.e., 200 m). The standard solution also proves unacceptable here for structural reasons, i.e., the incorporation of rolling stock wheels into the track with very small radii of the circular curves.

Using an extended connecting curve may prove to be the only advantageous solution in this situation. The proposed method of modifying reverse curves provides a practical solution to design problems.

Keywords: railway lines, reverse curves, modification methods, extended connecting curve concept, train speed analysis

5. Pearlitic Interlamellar Spacing as a Tool for Evaluating Hot-Forged R260 Steel Frog Points

Małgorzata Ostromęcka

pages: 149-157

Summary. The article presents an analysis of the usefulness of measuring pearlite interlamellar spacing in R260 steel frog points as a tool supporting the assessment of hot forging quality. The study was conducted using a digital light microscope. The work discusses the relationship between pearlite morphology and mechanical properties, highlighting the importance of quantitative microstructural evaluation in the context of technological process control of frog points.

Keywords: R260 steel, pearlite, interlamellar spacing, light microscopy, hardness, hot forging