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Abstract

Axle Load of Round Wood Transport Vehicles in Relation to Wood Assortment †

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Abstract: The variety of wood loads and their parameters (humidity, density, assortment) are often the cause of the increased total weight of the vehicle (GVW). With significant GVW exceeding, forest roads are exposed to high-tonnage vehicles, which results in vehicle axle loads above the accepted design parameters for the pavement. The purpose of this study was to investigate the real axle loads of round wood transport vehicles arising from the gross vehicle weight (GVW) of the transport set in different seasons of the year and depending on the type of transport set and the type of wood assortments. Measurements of axle loads for round wood truck transport sets were carried out on the sites of three large wood industry companies from the north of Poland, which process different types of wood. The load on the individual axles of the high tonnage truck units was measured using model DINI ARGEO WWSD portable truck scales with a 3590M309 weighing terminal with 0.01 t graduation. In total, measurements were taken for 904 round wood deliveries made by different transport sets: a truck and trailer set with 473 deliveries, including 344 deliveries by six-axle sets, a truck, and semi-trailer with 334 deliveries, where 193 were made by six-axle sets. The lowest axle load for all the sets occurred on axle one in the range of average values 7.07–7.86 t with a spread of results from 4.49 to 10.20 t. The highest average axle loads of 9.15–12.43 t was found on the axle for all the observed transport sets, where a maximum value of 14.52 t was also found. There were statistically significant differences in the values of the loads on individual axles depending on the type of truck set and type of wood assortment. Comparative analysis by the Kruskal–Wallis test of all axle load results depending on the vehicle types and number of axles, showed statistically significant differences. When analyzing the axle loads in five-axle sets with respect to the delivery date, statistically significant differences were found for all the axles. These differences occurred mainly for measurements performed in the summer and other seasons, the most visible of which were on the second and third axle. The loads of transported wood (assortments) also influenced the resulting axle loads, which was confirmed by statistical analysis. For most axles, there are differences in the axle loads for sets with MS (medium-size, industrial wood) deliveries and other assortments. Additionally, on axles 4–5, there are differences between Ls (large-size) deliveries and other deliveries (multiple mean rank test). In the case of TS transport sets, there is no big difference between the axle loads, only in the case of short assortment Ms where the second and third axles have higher average axle loads of just over 10 t. In the truck and trailer combinations (TT), the highest average axle loads are on the fourth and fifth axle in the range 8.5–12.0 t, with lower values for shorter 3.7 m and Ms grades. The distribution of the total gross vehicle weight of the set is, on average, 58–60% to the truck (three axles) and 40–42% to the trailer/semi-trailer (two axles) in five-axle sets and in six-axle sets, the truck and trailer/semi-trailer (three axles).

Keywords: total weight; gross vehicle weight; timber transport; axle overload; forest truck unit

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