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ON THE ESTIMATION OF COMPETITIVENESS OF MINE DUMP TRUCKS WITH OPERATION CONDITIONS TAKEN INTO ACCOUNT

Heavy dump trucks play a significant role in cargo transportation in open-cut mining. About 60% of the rock mass in domestic quarries and 85% in foreign quarries are transported by these vehicles. However, when estimating competitiveness of mine dump trucks, the factors characterizing the following particular operation conditions in quarries are not taken into account:

1) if the cargo is coarse abrasive rock or soft sticky unconsolidated rock;

2) that the rock is transported within the boundaries of the quarry for the distance not exceeding 4…5 km;

3) that the transportation is usually connected with the necessity to ascend and descend a vehicle to a certain depth of the working area of the quarry, which is conducted in the condition of low ventilation;

4) that a considerable part of roads have a complicated form and are being constantly translocated, which does not allow for their high-grade surfacing;

5) that the amounts of cargo depend on the amount of extracted of fossil fuels and developed overburden, which can be from several hundred thousand to several million tons per month;

6) and that rock mass is transported from working face at working area of opening and extraction benches to storages at the ore-dressing and processing plant (ore, lignite, granite etc.) or to dump areas (overburden); the mine dump trucks are loaded with rock by excavators or mobile loaders, while they unload automatically.

Taking into account the above said, it is clear that for more accurate estimation of competitiveness of mine dump trucks it is advisable to use the factors taking into consideration the peculiarities of working conditions of mine dump trucks because different models have different adaptability to the load transport conditions.

For convenience of calculations and understanding their physical sense we suggest estimating vehicles competitiveness with the help of technical-and-economic efficiency. This level is estimated with the equation:

$$E_{m.e} = \frac{1 - G_e}{G_m - 1}$$

where G_e and G_m are group factors in economic and technical parameters, respectively.

The difference (1 – G_e) shows if the costs decrease or increase after introduction of the main model in place of the basic one, thus estimating the efficiency of this change. If the difference is negative, it means that the implementation of the main model of the vehicle would lead to increased costs on cargo transportation. As the value G_m increases, there also increases the technical capability of the vehicle as to the growing amount of transportation (production). This is why the technical effect of changing the basic model of a vehicle into main one would be determined on the basis of difference (G_m–1). On the ground of this approach, the ratio (1–G_e)/(G_m–1) shows technical-and-economic efficiency of introducing new models of transport vehicles. The level of this efficiency may be accepted as the criterion for their competitiveness estimation.

Thus the value $E_{m.e}$ will characterize, on the one hand, the economic efficiency of introduction of the suggested model of the transport vehicle in comparison with the basic one, and on the other hand, its technical efficiency. Economic efficiency is measured by the costs of purchasing, maintenance and service of the vehicle; and technical efficiency characterizes how vehicle's specifications meet the requirements of the cargo transportation process.

This approach will allow for better consideration of the requirements to mine dump trucks in quarries and will drive up demand for these trucks.

Thus, the success of automobile manufacturers on the market depends not only on the vehicle's quality characteristics influencing the demand, but also on the estimation of the peculiarities of working conditions of mine dump trucks.