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Justification of Operation of Mercedes-Benz Buses After the Normative Life is Expired

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Abstract: *This article is currently devoted to road transport physical wear and tear and a number of other reasons motor vehicles may become unusable for further operation. For passenger transport of the city of Tashkent, Mercedes Ben’s buses of modification O405, O345LF were purchased: 200 units in 2008, 200 units in 2009, 100 units in 2012. and 2013 - 100 units. The manufacturer recommends 1.0 million km for these buses before they are written off. The first batches of these buses have worked out their resource and 131 of them have been decommissioned. Write-offs were carried out according to the act of the commission with a mileage of 900.0 ... 1400.0 thousand km. However, there is no theoretical justification for the life of the write-off. Therefore, the development of a methodology for writing off rolling stock according to technical condition and economic indicators is relevant.*

Keywords: *operation, car, means, bus, resource, Mercedes Benz.*

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Due to high physical wear and a number of other reasons, vehicles may become unsuitable for further operation. The basis for writing off from accounting can also be: inexpediency of restoration, theft (hijacking) of the vehicle, damage to the car as a result of road accidents, natural disasters (fire, flood, hurricane, etc.).

Procedures have been developed for writing off vehicles, documenting and coordinating this operation, as well as rules for reflecting the disposal of vehicles in accounting. At the same time, for the final decision to write off, it is necessary to assess the residual value of vehicles. Since motor vehicles, taking into account the considerable cost and their significance, are classified as especially valuable property. The document was developed on the basis of the results of scientific research, the processing of a large amount of statistical data on the vehicle markets in the Russian Federation, the analysis of the current regulatory and methodological documentation on the operation of vehicles, the analysis of practical experience in evaluating vehicles, as well as the analysis of foreign experience in the industry.

For passenger transport of the city of Tashkent, Mercedes Bens buses of modification O405, O345LF were purchased: 200 units in 2008, 200 units in 2009, 100 units in 2012. and 2013 - 100 units. The manufacturer recommends 1.0 million km for these buses before they are written off. The first batches of these buses have worked out their resource and 131 of them have been decommissioned. Write-offs were carried out according to the act of the commission with a mileage of 900.0 ... 1400.0 thousand km. However, there is no theoretical justification for the life of the write-off. Therefore, the development of a methodology for writing off rolling stock according to technical condition and economic indicators is relevant.

To date, bus mileage has a wide range: from 400.0 thousand km to 1400.0 thousand km. For example, Mercedes Bens buses, MJJ's "8 bus palace ", have the following first-time mileage, in thousand km:

Bus brand	Until 400	400-600	600-800	800-1000	1000-1200	1200-1400
Mercedes Bens,	3	9	31	34	8	3

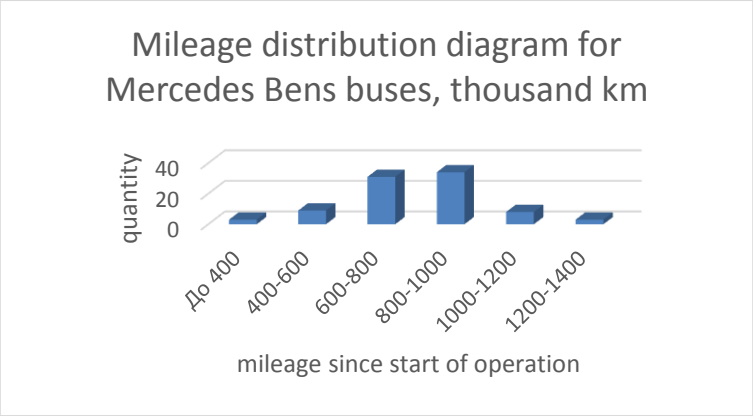

Fig.1. Mileage distribution of Mercedes Benz buses of 8-bus fleet.

From fig.1 shows that by now the largest number of buses has a mileage of 600 to 1000 thousand km, and 11 buses are operated with a mileage of more than the recommended resource, i.e. 1000 thousand km.

In order to avoid the occurrence of failures on the route, it is necessary to determine the residual resource based on the diagnosis of the bus and its units, and make a decision on decommissioning or further operation.

The residual resource is determined by the method of forecasting, taking into account the random nature of the change in the parameter, since in practice significant changes in operating conditions are often observed, including the load modes of the bus. For this reason, large deviations of the measurement results from the corresponding points lying on the theoretical smooth curve are possible.

Therefore, in order to obtain more accurate results, it is necessary to take into account random deviations of the measured parameters from the theoretical smooth curve, characterized by a prediction error. The error in predicting the technical condition of the constituent parts of machines usually obeys the normal distribution law, i.e., the deviations of this error from the true values of the sought values in the direction of increase and decrease are equally probable. This means that when forecasting, in 50 cases out of 100, the resource may be underused (for example, under good operating conditions of machines), and in 50 cases, failures are possible (for example, when machines operate in difficult conditions). In both cases, the costs of maintenance and repair of machines increase sharply: in the first case, due to unjustified stops of the machine, and in the

second, due to the elimination of failures, the increase in the cost of repairs or the decrease in efficiency.

To avoid the noted shortcomings, the residual resource is determined with a given confidence probability, for example, at 0.90, failures will occur only in 10 cases out of 100.

Under the normal distribution law of the forecasting error, the residual resource of the diagnostic object at any confidence level is determined by the formula:

$$\mathbf{L_{lim}} = \left(\mathbf{L_i} - \mathbf{L_{i-1}}\right) \cdot \left(\sqrt[\alpha]{\frac{\mathbf{S_P} - \mathbf{S_{nom}}}{\mathbf{S_i} - \mathbf{S_{nom}}} + \frac{Б \cdot \sigma}{Б \cdot \sigma + 1}} - \mathbf{1} \right)$$

$\mathbf{L_i}$ **-**$\mathbf{L_{i-1}}$ - mileage between tests

$\mathbf{L_i}$ – mileage, upon reaching which the value of the technical state parameter Si is reached.

$\mathbf{S_{nom}}$ – the initial value of the parameter.

$\mathbf{S_P}$ – the limiting value of the parameter of the technical condition of the object being diagnosed.

α - exponent, which determines the nature of the implementation.

Б — one of the characteristics of the distribution of the residual resource, depending on the confidence level.

δ - root mean square prediction error.

The forecasting error is distributed according to the normal law at $\delta \leq 0{,}33$ which satisfies most of the cases encountered in practice.

Confidence probability $F_o(B)$ in practice is called the degree of guarantee of the residual resource. With $F_o(B) = 1$, the guarantee $\mathbf{L_{lim}}$ is equal to 100%.

With an average value of the residual resource, the confidence probability is 0.5; the corresponding value B=0.

The confidence probability in each specific case is established based on the costs caused by the failure of the component, as well as on the conditions for ensuring the safety of work, etc. The greater the cost observed in case of failure, the greater should be the confidence level. When traffic safety is taken into account, the confidence probability is equated to the reliability of the diagnostic object and was taken equal to 0.95. For less critical details, the confidence probability was usually taken within 0.60 ... 0.95, for less important - 0.30 ... 0.60.

The recommended method makes it possible to determine more specific residual resources of bus parts, which can serve as the basis for making a decision to decommission an object without large losses.

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