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Built Prediction of Technical Condition Change of Mobile Equipment

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Abstract

Changing the technical condition of components and assemblies of mobile eequipments in the technical operation occurs on an entire rational function of n-th order, power and linear functions. For embedded diagnosis possible a more accurate determination of the residual resource on trends in technical condition.

Keywords: technical condition, the allowable mileage, mobile equipments, the residual resource forecasting

Introduction

Changes in the technical state of mobile vehicles can be represented as a function of time-dependent or run.
For such dependencies there is a certain relationship between the dependent variable and the independent variable, when a certain value of the argument corresponds to a definite value of the function. The most widely depending on mileage or time rate of change of the operating parameters of the technical state of the node, the machine, system or mobile vehicle as a whole [1, 2].

To make full use of the resource of mobile technology and objective determination of life to achieve the allowable parameter values necessary to develop simple method prediction based on the results of measurements rational number of parameters embedded diagnostics containing the necessary information the technical condition of basic and fundamental parts. It is most convenient to use the data for this built-in diagnostics, for setting trends, since it is possible to use the values of the last more than two dimensions, which allows more accurate prediction of the parameter depending on the function to achieve the allowable value, the change in the trend may fix according to the latest measurements. In this case, the accuracy of the prediction of technical condition does not depend on the theoretical calculated dependences, but primarily observed dependence on the actual conditions and mode work site, detail, and accuracy of the measurement of the corresponding parameters [3].

Experimental study

Limiting the change of diagnostic parameters valid value, we can predict a change to the technical state of gradual failures and prevent them, adjusting the frequency of maintenance and spare parts consumption rates, operational materials, and thus the cost of maintenance and repair.

To determine the residual resource based on the built-in diagnostics is not necessary to know the initial value of the measured parameter, running from the beginning operation, it is necessary to determine the value of the parameter being measured at a given time and the establishment of functional dependence. Why identify at least five parameter values measured prior to and considered acceptable for this parameter.

In order to determine the nature of the curve parameter changes, it is necessary to measure the brightness changes parameter state test pieces interfaces and nodes several times. When forecasting residual resource of a particular element, is assuming that the exponent for the type of elements is not known in advance and is set based on curve fitting obtained integrated diagnosis.

Accounting for the actual patterns of wear and measure specific diagnostic parameters of the vehicle in the past period. In the operation of changing operating conditions of mobile vehicles, which results in an adjustment to the operation of the projected period allowable value.

To develop recommendations for sound technical operation, the timely implementation of maintenance vehicles require information about the technical state of change. Such information may be obtained based on the determination of parameters for the built-in diagnosis (Figure 1). Among the most important are: changing the technical condition of the vehicle unit, details on operating time or mileage of the car; allowable setting technical condition, the limit value parameters to technical condition. From these parameters is determined by the residual resource, which will determine the duration of the repair and maintenance work; the formation of the total flow preventive effect vehicle or group of vehicles.

Results and discussion

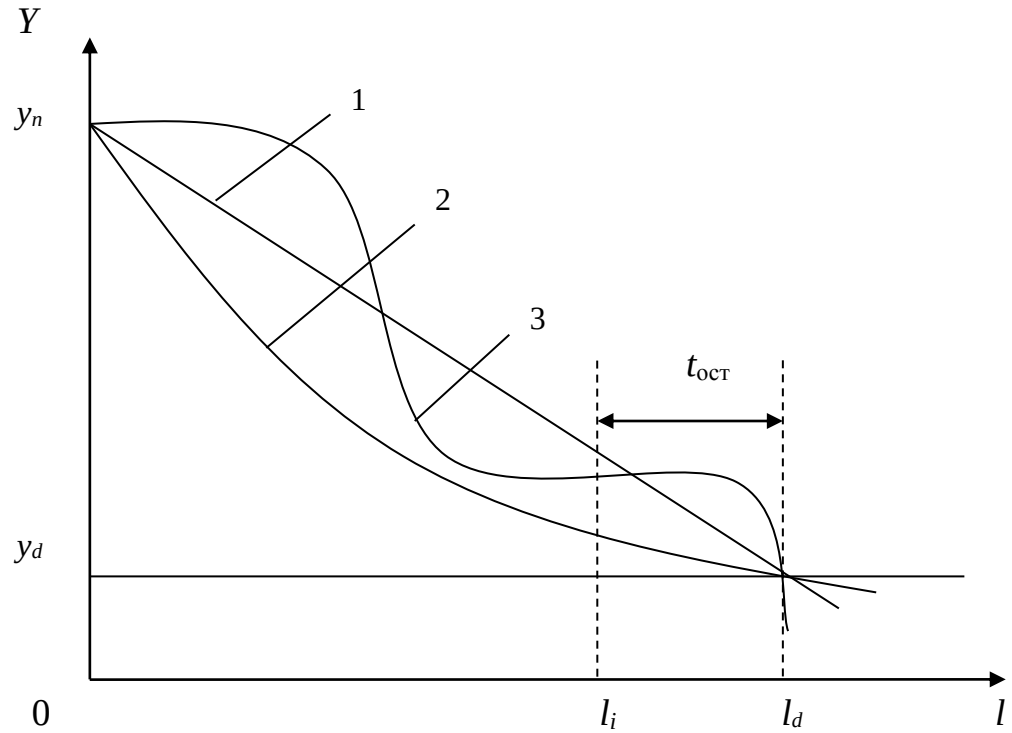
The most widely used in the technical operation of the vehicle is a power, linear and rational functions. To determine the moment of reaching the allowable value of the parameter of a technical condition of the car determines the point of intersection of the line $y = y_д$ equal and therefore power, linear and rational functions.

For an entire rational function of n-th order

$$l_{dr} = \begin{cases} y = a_0 + a_1 l + a_2 l^2 + \cdots + a_n l^n \\ y = y_d \end{cases},$$

where a_0 - initial value technical condition; l - operating time; $a_1, a_2 \ldots a_n$ - factors that determine the nature and degree of dependence in *l*.

Due to the random nature of the process of wear components and interfaces of the engine and transmission units change diagnostic parameters are always approximate a function. On this basis, it is known several forecasting methods of technical condition and residual resource units of mobile technology. The most widely used methods for predicting machine resource, which is used as a power function approximating.



1 - linear; 2 - degree; 3 - rational; y_n - nominal value; y_d - the allowable value; l_i - running the latest firmware diagnostics; l_d - allowable mileage.

Figure 1: Graphical representation of linear, rational and power forecasting technical condition of cars with built-in diagnosis

Power function has sufficient versatility factor, have a clear physical meaning and little. This explains wide use the power function in the theory of prediction.

For degree

$$l_{dd} = \begin{cases} y = a_0 + a_1 l^b \\ y = y_d \end{cases},$$

where a_1 and b - coefficients that determine the intensity and nature of the technical condition of the parameter.

For linear

$$l_{dl} = \begin{cases} y = a_0 + a_1 l \\ y = y_d \end{cases},$$

where a_1 - intensity parameter change technical condition, depending on the design, manufacturing and operating conditions.

To find the corresponding curve point on the graph with a valid connection and set the allowable mileage on the x-axis l_d, while the remaining service life is determined by the formula:

$$t_{ocm} = l_d - l_i$$

Conclusion

Functions defined on the basis of the built-in diagnostics have sufficient flexibility coefficients have a clear physical meaning. This explains the widespread use of power, linear and rational functions in the technical operation, which predict the technical condition of mobile equipment.

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