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Transportation Research Procedia 20 (2017) 695 – 701

Transportation Research Procedia

www.elsevier.com/locate/procedia

12th International Conference "Organization and Traffic Safety Management in large cities", SPbOTSIC-2016, 28-30 September 2016, St. Petersburg, Russia

Model of Operation of Motor Vehicles Based on Monitoring of Their Performance Characteristics

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Abstract

The article states that one of the tasks of increasing operational quality of motor vehicles (MV) by monitoring their performance characteristics is the development of a model of control and management of the MV condition based on monitoring of the MV performance characteristics and joint consideration of a “tree” of objectives and a “tree” of systems.

Peer-review under responsibility of the organizing committee of the 12th International Conference “Organization and Traffic Safety Management in large cities”

Keywords: model of control and management of the MV technical condition; monitoring of the MV performance characteristics; vehicle driving performance; tree of objectives; tree of systems

1. Main text

A scheme of methodological basis of control and management of the vehicle technical condition is shown in Fig. 1. The certification system for MV maintenance and repair is accommodated to the current economic situation and based on a system of mandatory special-purpose standards (SPS), being a facilitating mechanism for operational maintenance of MVs.

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Peer-review under responsibility of the organizing committee of the 12th International Conference “Organization and Traffic Safety Management in large cities”
doi:10.1016/j.trpro.2017.01.113

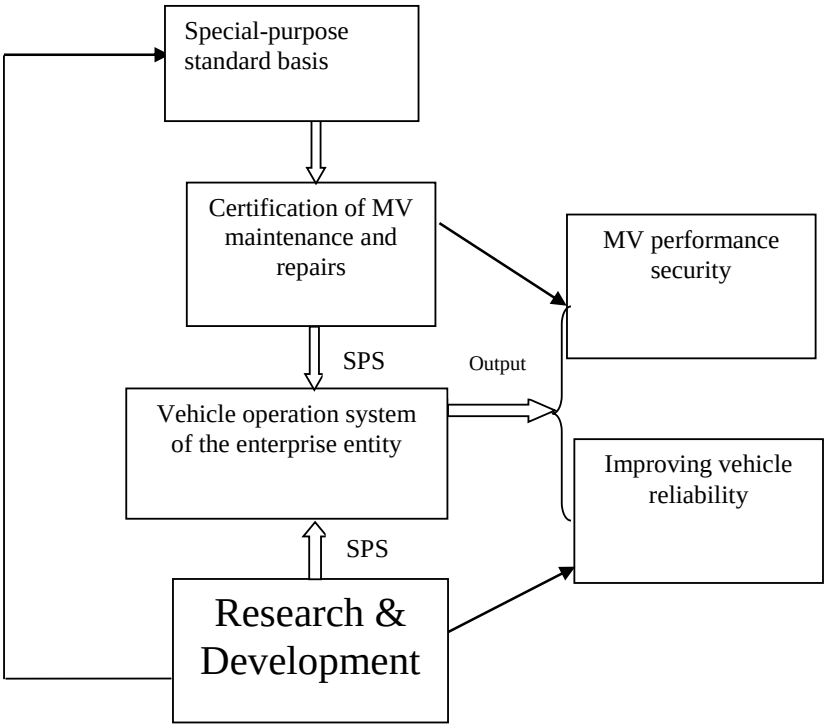

Fig. 1. Scheme of methodological basis of control and management of MV operational performance.

Results of R&D are a multidimensional space aimed at improving reliability of MV operational performance. It is suggested to solve these tasks with the help of joint consideration of a tree of objectives and a tree of systems. According to the definition of Ye. S. Kuznetsov (1997), the system objective is its possible future state achieved by certain actions.

Relation between low level and high level objectives in the tree of objectives is based on the principle of subordination, expressed in determination of low level objective contribution into achievement of a high level objective. Objectives of the same level complement each other so that their implementation would ensure full achievement of a higher level objective. The objective of the high level I is represented as O^i, the objective of the low level is represented as O_{ik}^i, where k is a serial number of a sub-objective in the series of low level sub-objectives. For example, the first objective of the first level is indicated as O_{01}^0, while the third objective of the first level is indicated as O_{03}^0.

Relation between an objective and a sub-objective would be significance (contribution) of a low level sub-objective in the achievement of a higher level objective. For this purpose, a concept of an arc of impact r_{ik}^i of a subordinate sub-objective on a higher level objective is used. Thus, an arc connecting the general objective O^0 with the first sub-objective of the first level O_{01}^0 can be defined as r_{01}^0. At that, impact of the lower level sub-objective O_{ik}^i on a higher level objective O^i can be determined as follows:

$$O^i = O_{ik}^i \cdot r_{ik}^i \tag{1}$$