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Development of Technological Documentation for Maintenance and Repair Using a Modular Approach

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The most important problem of technical operation of cars is the effective management of their working capacity since the effectiveness of using different service technologies allows to increase the resource, to reduce idle time and the costs of operation and guarantees high operational reliability. By the interstate standards it is established that technical maintenance and repair are necessary types of work in a standard life cycle of a product [1]. The information support of the technical maintenance system and the equipment repair along with the design documents includes organizational, technical and technology documents.

According to expert assessment, the optimal performance of technology operations of technical maintenance and car repairs results in the increase of the between-repairs run of cars and cutting costs for technical maintenance and repair by 10-15%, and allows to provide the planned operation resource.

Technological processes of technical maintenance and repair are developed by all leading producers of cars in the process of new models production.

The leading foreign manufacturers implemented the system of electronic technical documentation. For example, for cars of the German concern *Daimler AG* technology processes of technical maintenance and repair according to the service program *Mercedes EWA net-WIS* [2] are used, for service of the MAN cars the service program by *MAN Workshop*

Infosystem (MAN WIS) [3] is used, for Volvo – *Volvo Impact 02-2015 (Bus & Lorry)* is developed [4]. Similar programs are developed and are implemented by PJSC KAMAZ and Group of the GAZ company.

Since 2000 JSC MAZ and BELNIIT Transtekhnika have been working at the creation of the specifications and technical documentation for technical maintenance and repair of MAZ new models and these results are still being used in servicing trucks and buses. During that period technology documentation practically for all new models of vehicles, including low-tonnage cars MAZ 4370, dump trucks MAZ 5516, MAZ 5551, truck tractors MAZ 5440, MAZ 6430, buses of the 1st and 2nd generations, trailers and semi-trailers was developed. Documentation was developed on papers. Besides, the complete set of documentation was prepared for each model.

At the same time there is a problem in using such documentation, including its distribution in service centers (now the JSC MAZ has 30 service centers in the Republic of Belarus and 200 – in foreign countries). Besides, current trends in commercial automotive industry show that updating the model range is becoming rapid, manufacturers including JSC MAZ, tend to work under the requirements of the specific customer. Respectively there is a large number of modifications of cars for which the documentation in technical maintenance and repair is also necessary.

To increase the efficiency of the development of MAZ cars service technology processes their development on basic models with the use of modular approach is offered.

Actually it is the creation of the database of separate technology processes and the simplest assembly program of the technical process.

The car consists of certain nodes and units. However, a simple assembly of a complete set will break real communication of nodes regarding their service. Therefore, the

binding of nodes and the systems of cars will be carried out in their location in the car. For example, the exhaust system of gases, the cooling system, rudder control, a frame, a cabin, the suspender, a front axle will be tied to a basic car model, and a supply system – to an engine make.

Having specified a basic car model and models of the nodes and units, the program will make the process of technical maintenance or repair. The software in creation of technology processes is going to be implemented on the basis of the electronic service program *Unified Information System on Technical Maintenance of Cars MAZ* [5].

For full coverage of different options of a complete set it is necessary to develop technology processes of technical maintenance and repair for all component parts used in assembly. An integral part of the technology process is the labor input of work which can be presented in the form of the separate module with a simple search engine. Thus, the possibility of documentation use becomes much simpler. The list of the component parts used is covered by 37 models of vehicles for the development of technical maintenance processes and by 20 models for repair. These are biaxial and three-axial cars, truck tractors and platform buses. With the advent of new models with the units which are not included in the provided list the technology process only on this unit or a node will be developed.

Processes contain technical requirements and instructions, the sequence and time allowance of operation performance, the equipment and the materials used, personnel qualification etc. Besides, with the change of technical requirements (for example, the use of new materials, the oils of better quality, etc.) modification of technical process won't be required. It will be enough to make changes in the database. The technology documentation developed on such principle will provide full functioning of the electronic service program

of JSC MAZ – *A unified information system on technical maintenance of cars MAZ* the analogs of which do not exist in the Republic of Belarus.

Implementation of the project will allow to provide service maintenance of all model range of the equipment made by JSC MAZ, including new models of automatic telephone exchange. At the same time the changes in the system and repair will be immediately considered. The organization and repair of MAZ cars will be comparable with service support of the leading manufacturers of cars thus increasing the competitiveness of JSC MAZ cars.

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