

THE POSITION OF DIAGNOSTICS AND MOTOR-SERVICE IN TRANSPORT-LOGISTIC SYSTEM OF THE UKRAINE

Grugoriy Nechaev, Maxim Luchko

Volodymyr Dal East-Ukrainian National University, Lugansk, Ukraine

Summary. The analyses reasons and methods technical influence on rolling stock in Ukraine. The presented place and role of the diagnostics under technical influence in modern attitude.

Key words: diagnostic, technical influence, motor-service, transport.

INTRODUCTION

At present Ukraine is a major producer and operator of a wide range of road, water, air transport, having a developed network of main motor roads and railways, of pipeline, sea, river and air communications. The major share of transport traffic, both internal and transit ones, rests on railway transport and vehicles with the increasing participation of the latter.

Operation of vehicles in the country is carried by enterprises of various structure, size and form of ownership, i.e. starting with small private firms to the largest motor transport companies-carriers that gained good references in countries of Euro-Asian continent and holding the most powerful repair and maintenance base. Among them – a well-known road carrier, close joint- stock company “LA-Trans” that operates the newest rolling-stock and trailer of the world’s leading motor producers, such as Mercedes, Volvo, Kogel and Schmitz.

RESEARCH OBJECT

The main priorities of operation policy in Ukraine take into account trends in world economy that is characterized by expansion of the manufacturing relations and by international economic cooperation. At the same time issues on fuel saving arise as well as reduction of effluents and heat ejection into environment, those caused by exhaust gases, ensuring transport safety. Achievement of significant results in this sphere is possible only in case when vehicle is serviceable and meets all European standards. That is why it is necessary to pay more attention to how control and maintenance of

serviceability of rolling-stock is being implemented in Ukraine, methods and structures applied.

The fulfilling of the main logistic postulate of carriers “just in time” has also put stringent requirements related to quality, regularity and reliability assurance of transport connections, safety of cargo and transport operations, speed and cost of cargo delivery, serviceability and no failure operations of the rolling-stock during its work in the line.

The guaranty of quick and qualitative maintenance of serviceability of vehicles being operated is to be provided by maintenance and repairs stations that are characterized by variety of organizational forms and methods of process operations implementation. So, if in the last years maintenance and repair works were executed either on the production base of vehicles holders or at producers’ service centres, then now increase of vehicles output, sales and transport services market development initiated the necessity of establishing new serviceability maintenance services, that include workshops of motor transport enterprises, technical maintenance stations, motor repair plants. Enlarging of the servicing companies networks is achieved by involvement of dealers and independent firms.

RESULTS OF EXPERIMENTAL RESEARCH

Analyses indicates that workshops of vehicles holders are leading in terms of frequency of servicing. They carry out simple regular preventive operations or the smallest and not labour-intensive works, most frequent works on troubleshooting. More complex types of preventive works as well as labour-intensive types of works are carried out by specialized enterprises. An obvious illustration to that is distribution of shares of total annual income of enterprises rendering rolling-stock operational services (fig.1). The major share of the total annual income of enterprises rendering services falls on technical maintenance stations.

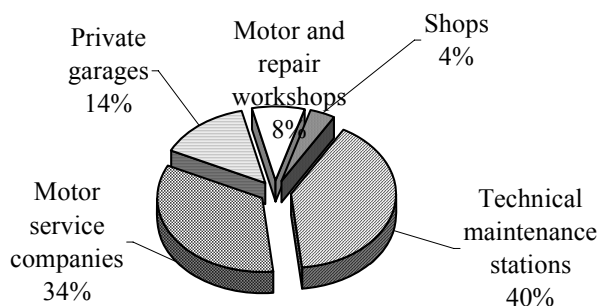


Fig.1. Incomes of enterprises rendering services

Provision of efficiency of vehicles in the process of their operation require investments by 5-6 times more, than ones to be spent on their production. This means that approximately 17% of expenses fall on production and 83% - on maintenance and

repairs. If we take the letter shave of total expenses related to vehicle production and maintenance, 100%, then its components: will have the following proportion 25% (or 20,75% of the total) maintenance, 45%(37,35%) – routine repairs and 30% (24,9%) – overhauls.

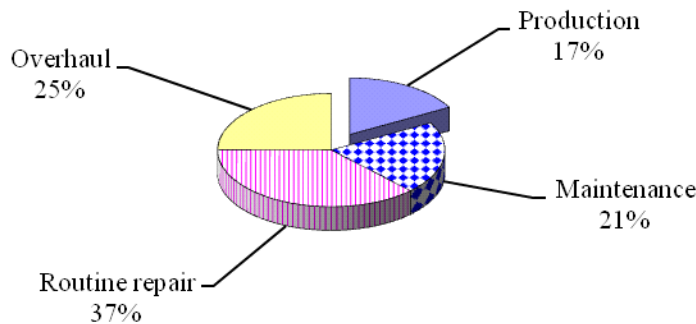


Fig.2. Structure of costs related to a vehicle life cycle

The main tactics related to maintenance of vehicles serviceability are based on: operating time (run) and specific types of impact, technical (the diagnostic tactics) and mixed (combining components of the first two tactics).

Major difference of the diagnostics is that it actively favours costs reduction on every component mentioned. Taking into account, that at present maintenance and routine repair costs range from 17% to 25% in the structure of passenger and cargo traffic handling cost, it is not difficult to realize the diagnostics importance in raising effectiveness of rolling-stock maintenance and increasing profitability of motor transport enterprises.

At the same time we should dwell on the importance of vehicles diagnostics for improvement of traffic safety. Still a number of road accidents caused by faults of vehicles is large system consequences of such road accidents are when they are caused by faults breaks in steering wheel, running gear. The ratio of vehicles faults and failures, resulted in road accidents is shown in table 1 and figure 3.

Table 1. Distribution of fault 2 failures that cause road accidents, %

Aggregates, units and equipment	Number of road accidents, %
Break	51,2
Steering wheel	13,4
Lightning fixture (head lights etc.)	12,2
Signal equipment	6,1
Running gear	4,9
Other units (aggregates)	12,2

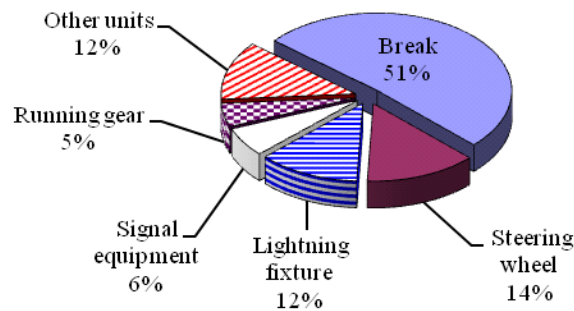


Fig. 3. The proportion of system faults and failure, that cause road accidents

Uncertainty in efficiency assessment through technical state parameters of a specific vehicle is detected by diagnostics that is an applied continuation of analytical methods of the reliability and vehicles maintenance theories. It allows to determine exactly state of every tie-in, aggregate, unit or system without its disassembling.

However without serviceability forecasting the diagnostics cannot maintain it on the required level due to the risk of missing occurrence sudden failures and those pre-emergency states that appear in no time at the stage of parts catastrophic wear. That is why a common complex of serviceability management methods is being established that takes into account statistic characteristics of reliability and diagnostics results. Motor transport companies are extremely interested that when operating vehicles efficiently the vehicles will not fail suddenly or their aggregates will not wear out during the run, necessary for implementation of planned tasks of passenger or cargo transportations.

Traditionally for practical aims motor transport companies have at their disposal the methods of maintenance of rolling-stock serviceability at three management levels:

1 – operational management and serviceability forecasting of each vehicle with reference to its maintenance reliability and diagnostics results;

2 – adjustment of diagnostics frequency aimed at preventive assessments of serviceability potential of vehicles aggregates and systems and based on the criteria of minimum risk;

3 – assessment of vehicle actual state and choosing optimum strategy for serviceability maintenance of motor transport company stock in general.

Diagnostics allows to reduce scope of monitoring activities significantly and at the same time to determine reliably and without bias the real need for preventive measures in specific aggregates (units). It helps to define what operations (e.g., adjustment) should be excluded from the maintenance process as present state of the vehicle (aggregate) does not require it.

Occurrence of faults and failures of aggregates and machines is quite natural. It is practically impossible to prevent and eliminate their occurrence completely by preventive measures taken with previously planned frequency in the course of operating time the number of faults and failures increases. Routine repairs are carried out to eliminate them. Monitoring works have significant part in this process. In order to establish causes of faults in aggregates, mechanisms and tie-ins the disassembly is often

conducted. Carrying out of disassembly-assembly activities promotes for intensive increasing of wears and reduces reliability and durability of vehicle.

Diagnostics allows to determine technical state of an aggregate (mechanism) objectively and without disassembling based on its operation, i.e. by quantitative indicators of diagnostics parameters with the given mode of operation of examined aggregates.

Exclusion of disassembly-assembly operations reduces labour intensiveness of routine repairs and increases production standards.

Trustworthy objective monitoring, provided by diagnostics allows to determine timely presence of different operational parameters the standard, remove the deviations from and stop fault developing and prevent failure occurrence. Thus diagnostics provides for economy of spare parts and maintenance materials.

Increased operation level main of roads transport in motor ways of country has initiated establishing of motor service centers networks.

Motor service enterprises promote directly increasing of income and profitability of companies, holders of motor transport, at the expense of quick and professional maintenance of transport serviceability. Secondly, diagnostics and repair services present large, and in some cases, major source of income of these enterprises.

Motor service centers in Ukraine are equipped with up-to-date diagnostics complexes, that include the whole range of diagnostics and repair facilities: engine diagnostics systems, gas analyses, break (test) stands, stands of suspension geometry analysis; instrumental test (control) line; stands for Diesel engine services; starting charging devices etc. mainly these are 'BOSCH' company products, specially adapted for Ukraine.

Establishing enlarged service enterprises a acceptance station has direct and great importance, i.e. diagnostic center, where assessments of states and serviceability of units, tie-ins aggregates and whole vehicles are carried, recommendations on necessary operations are given. Facilities in diagnostic center of service enterprise should meet the requirements of operation speed, minimum maintenance expenses, clearness and accuracy. Usually the spectrum of equipment consists of toe-in and toe-out tester shock-absorbers and suspension tester, break roller stand, 2 entrances lift platform with backlash detector built in, head lights tester, four-dimensional gas analyzer for instrumental control of engine (smoke density indicator for Diesel engines). All equipment of the section is tied up in a common network and closes the circuit in central post (bay), where foreman controls the terminals and all data is gathered there to be stored and processed. It can be obtained in any form: digital or graphical, on the screen or printer. A device for extraction of exhausts is used.

At large motor service enterprises specialized centers of operational control, maintenance and repair of rolling-stock exist. Such centers are complete producing complexes.

Diagnostic activities complex (D-1) carried out before the first maintenance service (MS-1), is applied diagnostics of units and systems that guarantee safe traffic. In-depth diagnostics (D-2) is carried out a day of two before maintenance service-2 to provide MS-2 zone with the information on future scope of works and if larger scope of routine repair works is detected then a vehicle should be redirected to routine repair zone. At motor transport enterprises D-1 and D-2 are united in one section that operates

in several shifts with combined stationary stands used. At large motor transport enterprises and technical maintenance stations all diagnostics facilities are to be centralized and automated efficiently.

Detection of diagnostics' place in the process of vehicles maintenance and repair for formulation of main requirements to its facilities. Quick automated facilities applied to diagnose break of mechanisms and steering wheel when diagnosing mechanisms ensuring traffic safety.

When diagnosing a vehicle as a whole (D-2) stands with running drums are applied detecting power and economic indices together with state of systems and aggregates that are maximum approximated to conditions of vehicles operation to be diagnose. Mobile and portable diagnostics equipment and devices are used for diagnostics combined with maintenance and repairs.

The aim of diagnostics on routine repairs is detection of failures or faults and identification of the most effective method of their elimination: on the spot, with removal of a unite or aggregates, with their complete or partial disassembling, and further adjustment. Mobile diagnostics with the help of mobile stations become more and more popular.

Diagnostics processes not only provide for faults detection and elaboration of strategies for their elimination, but also provide for accumulation of data of faults and failures, and their analysis results in specific recommendations for the producers of vehicles, road-workers and operators. Increased requirements from the view of provision of traffic safety and efficiency of vehicles (the international standard ISO 9000) demanded application of diagnostics process at all the stages of the life cycle, i.e. from design (tasks of ensuring suitability for control) till the moment of utilization (control parameters reflecting economic, environment and capacity indices).

CONCLUSION

Thus diagnostics is an important tool of the individual approach to vehicle, economic growth and profitability both of transport complex of individual forwarding companies and whole transport industry of the country.

Advantageous geopolitical location of Ukraine provided for creation of Euro-Asian transport corridors. Due to this the number of transit rolling-stock and trailer, daily operated in the roads of Ukraine increased significantly. This argument stipulates development, improvement and expansion of motor service and motorservice companies that have occupied a significant niche in the life of motor transport related to up-to-date and quality maintenance of rolling-stock serviceability.

REFERENCES

1. B. Karpinski, B. Makuh. Transport system Ukraine in context euro integration. Economic Ukraine, №7, 1998.
2. Govorushenko N., Turenko A.. Sistemotekhnika transporta. P1. – Kharkov: RIO HGADTU, 1998. – 255p.

3. Goncharov V., Kravchenko A., Luchko M. The present state of diagnostics and maintenance transport in Ukraine. National conference of maintenance and quality insurance. – Pech, Hungary, 2003
4. LUCHKO M. Estimation of conditions of exploitation of an industrial technological autotransport in conditions of quarry. Visnik EUNU after V. Dal – East Ukraine National University after V. Dal – Lugansk, 2002. № 12(58) – P. 111-117.
5. Girin V., Luchko M., Girin V. Sistem's control i metod snigenia rashoda topliva transportnih sredstv I spectehniki. Visnik KTU – Krivorogski technical University – Krivoi Rog, 2007. № 8 - P. 101-107
6. Luchko M. Opredelenie mesta proizvodstva biotoplivnih smesei v logisticheskoi cepochke potreblenia. Visnik EUNU after V. Dal – East Ukraine National University after V. Dal - Lugansk, – №. 4 (134).2009, c. 152-155
7. Luchko M. Analis rezultatov modelirovania raboti kariernogo transporta. Visnik EUNU after V. Dal – East Ukraine National University after V. Dal - Lugansk, – 2004. – №10(68). P1. – C. 151-156.
8. Kutsenko V., Luchko M. The system planning of operation motor dump truck to account the mining conditions and percentage content of the useful component fossilized in the ore quarries / Visnik EUNU after V. Dal – East Ukraine National University after V. Dal - Lugansk, 2005. № 89 - P. 230-234
9. Luchko M., Girin V. The Development of the diagnostics and usages of the rolling stock in logistic transport chain / Visnik EUNU after V. Dal – East Ukraine National University after V. Dal - Lugansk, – №. 5 (135). 2009. – C. 128-133
10. Luchko M., Girin V., Gukov S. The Analysis of the use bio fuel for motor-cars and development of a new method of receipt clean composite fuel. Visnik EUNU after V. Dal East Ukraine National University after V. Dal - Lugansk, 2008. № № 7(125) - P. 150-156

РОЛЬ ДИАГНОСТИКИ И АВТОСЕРВИСА В ТРАНСПОРТНО – ЛОГИСТИЧЕСКОЙ СИСТЕМЕ УКРАИНЫ

Нечаев Г.И., Лучко М. И.

Аннотация. Проанализированы причины, методы и подходы технических воздействий на подвижной состав в Украине. Показано место и роль диагностики при технических воздействиях в современном отношении.

Ключевые слова: эксплуатационная политика, уровень эксплуатации, три уровня управления, диагностика, жизненный цикл автомобиля.