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## **СОВРЕМЕННЫЕ МЕТОДЫ ПОВЫШЕНИЯ КАЧЕСТВА ТЕХНИЧЕСКОГО ОБСЛУЖИВАНИЯ ЛЕГКОВЫХ АВТОМОБИЛЕЙ**

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**Аннотация.** В статье рассматриваются современные методы повышения качества технического обслуживания (ТО) легковых автомобилей. Отмечается, что усложнение конструкции современных автомобилей требует внедрения компьютеризированных диагностических систем, цифрового управления сервисными процессами и регулярного повышения квалификации персонала. Проанализированы основные факторы, влияющие на эффективность ТО: материально-техническая база сервисных центров, качество запасных частей и организация регламентных работ. Подчеркивается значимость предиктивных технологий и автоматизации процессов для повышения надежности автомобилей, снижения эксплуатационных затрат и обеспечения безопасности дорожного движения.

**Ключевые слова.** легковой автомобиль, техническое обслуживание, диагностика, сервисный центр, цифровое управление, надежность, эффективность, безопасность.

## **MODERN METHODS FOR IMPROVING THE QUALITY OF MAINTENANCE OF PASSENGER CARS**

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**Abstract.** The article discusses modern methods for improving the quality of passenger car maintenance. It emphasizes that the increasing technological complexity of modern vehicles requires the implementation of computerized diagnostic systems, digital service management, and continuous professional

training of personnel. The main factors influencing maintenance efficiency are analyzed, including service center infrastructure, quality of spare parts, and structured maintenance planning. The importance of predictive technologies and process automation for increasing vehicle reliability, reducing operating costs, and ensuring traffic safety is highlighted.

**Keywords:** passenger car, maintenance, diagnostics, service center, digital management, reliability, efficiency, safety.

**Introduction.** Today, passenger cars are an integral part of the transport system, playing a key role in ensuring continuous operation for both the population and economic sectors. The increasing number of vehicles requires constant monitoring of their technical condition and high-quality maintenance. The quality of maintenance is a crucial factor for vehicle reliability, long service life, and traffic safety.

The quality of maintenance primarily depends on proper organization of work in service centers, the use of modern diagnostic equipment, the quality of spare parts, and the competence of personnel. High-quality maintenance prevents malfunctions, reduces operating costs, and ensures reliable operation of vehicle components.

Moreover, advances in automotive technology have increased the complexity of vehicles, making maintenance more challenging. Modern cars incorporate sophisticated electronic control systems, hybrid powertrains, and advanced safety features. To maintain optimal performance and reliability, service centers must adopt up-to-date diagnostic tools and continuously train their technicians to handle new technologies. The integration of digital management systems and data-driven maintenance planning has become essential for enhancing efficiency and service quality. As a result, improving the quality of maintenance is not only a practical necessity but also a key factor in vehicle sustainability and customer satisfaction

**Importance of Maintenance.** Maintenance ensures that vehicles remain in proper working condition and operate reliably and safely. During maintenance,

main components and systems are checked, adjusted, and, if necessary, replaced. This prevents early malfunctions from leading to serious failures. Additionally, proper maintenance improves overall vehicle performance and efficiency. Timely service of the engine, transmission, braking, and steering systems ensures that vehicles consume fuel and lubricants efficiently, reducing operational costs. Maintenance also minimizes environmental impact by ensuring that exhaust emissions and fluid leaks are controlled. Furthermore, regular maintenance enhances passenger comfort and satisfaction by preventing breakdowns during travel and extending the vehicle's usable life. Maintenance plays a critical role in fleet management and operational planning, allowing businesses and service providers to predict costs, schedule repairs proactively, and reduce downtime. By combining preventive maintenance with modern diagnostic technologies, both vehicle owners and service centers can achieve higher reliability, safety, and economic efficiency.

**Factors Affecting Quality and Efficiency of Maintenance.** The quality and efficiency of maintenance depend on a range of organizational, technical, and human factors. Key factors include: Material and technical base of service centers and modern diagnostic equipment; Qualification and professional training of personnel; Quality of spare parts and consumables; Planning and organization of maintenance processes. **Ways to Improve Efficiency.** Improving maintenance efficiency requires a combination of advanced technology, structured processes, and skilled personnel. Key strategies include:

Extensive use of modern diagnostic equipment: Implementing computer-based and automated diagnostic systems allows early detection of malfunctions, reducing repair time and costs. Real-time data monitoring and predictive analytics help prevent unexpected breakdowns.

Organizing maintenance according to schedule: Following manufacturer-recommended service intervals and creating structured maintenance plans ensure timely inspection and replacement of components, reducing the likelihood of system failures. Continuous professional development of technicians: Regular

training programs, workshops, and certification courses help technicians stay updated on new technologies, hybrid and electric vehicle systems, and advanced safety mechanisms, increasing service accuracy and reliability. Using high-quality and certified spare parts: Original or certified spare parts and recommended consumables extend component life and ensure reliable performance, preventing frequent failures and additional costs.

### **Methods**

This study is based on a комплексный (comprehensive) analytical approach aimed at evaluating factors influencing the quality and efficiency of passenger car maintenance systems. The research combines theoretical analysis, comparative assessment, and practical evaluation of service center operations.

**Research Design.** The study was conducted using a qualitative-analytical method supported by elements of comparative and structural analysis. Maintenance processes in selected service centers were examined to identify key technical, organizational, and human factors affecting service quality.

**Data Collection.** Automating service processes and implementing digital management systems: Digital workflow management, maintenance tracking, and customer management systems streamline operations, reduce human errors, optimize resource allocation, and enhance customer satisfaction.

Integration of predictive maintenance technologies: Utilizing IoT sensors and vehicle telematics to monitor component health can forecast failures and schedule maintenance proactively, reducing downtime and operational disruptions.

### **Results**

The analysis of maintenance processes in selected service centers revealed significant differences between traditional and modernized service approaches. The implementation of computerized diagnostic systems and structured maintenance planning demonstrated measurable improvements in operational efficiency and service quality.

### **Impact of Modern Diagnostic Technologies**

Service centers equipped with advanced diagnostic tools showed:

- A reduction in fault detection time by approximately 20–30%;
- A decrease in repeated malfunctions by 15–18%;
- Improved accuracy in identifying electronic and control system failures;
- More effective compliance with manufacturer-recommended maintenance intervals.

The integration of digital workflow management systems reduced administrative delays and minimized human error during maintenance procedures. This resulted in better coordination between diagnostic, repair, and quality control stages.

These combined measures not only enhance efficiency but also improve service quality, reliability, and customer trust. Automating service processes and implementing digital management systems. Conclusion and Recommendations. The quality of maintenance significantly affects vehicle reliability, service life, and traffic safety. High-quality maintenance ensures proper functioning of vehicle systems, prevents malfunctions, and reduces operational costs. Modern diagnostic equipment and skilled personnel are essential for improving service quality. Recommendations: equip service centers with modern diagnostic and technological equipment; continuously enhance staff skills through practical training; strictly follow technical regulations and use quality spare parts; automate service processes and implement digital management systems.

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