Impact Factor: 9.9 ISSN-L: 2544-980X

DEVELOPMENT OF A METHODOLOGY FOR CALCULATING THE DEMAND FOR SPARE PARTS IN CAR SERVICE COMPANIES

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Abstract: This article focuses on the development, current challenges, and future rospects of car service companies. The supply of spare parts and materials to these enterprises requires scientifically grounded proposals regarding the role of the transport system in the national economy, systematic analysis of existing issues, and identification of development pathways.

Keywords: automobile, auto service, dealer offices, spare parts, car design, components, assemblies, automotive industry, maintenance, repair.

Introduction

The automotive industry in our country is rapidly developing. In the current market economy conditions, the necessity of finding new, promising, and effective methods for ensuring the supply of spare parts and materials to car service companies (CSCs) has arisen.

The traditional system for supplying spare parts to CSCs has become outdated. Spare parts and materials are now delivered through dealer points, car service shops, and markets, but these suppliers often fail to guarantee product quality. Moreover, the centralized supply system that once ensured the distribution of spare parts across former Soviet republics has ceased to function.

There are several reasons why the quality and availability of spare parts supplied to CSCs, dealer offices, and shops fail to meet demand. Among these, the primary issue is the lack of information on the required quantities of spare parts for each type, alongside inadequate analysis of their quality and availability across regions or the country. Additionally, there is no software infrastructure to monitor and manage spare parts usage.

Methodology

In foreign supply systems, automobile manufacturers serve as the primary suppliers of spare parts. These systems often consist of three-level warehouses: central spare parts warehouses, regional warehouses, and dealer storage facilities. Some companies utilize a four-level system, where regional warehouses are supported by intermediary storage facilities.

Major automotive companies have demonstrated a direct correlation between vehicle sales and the provision of spare parts. The volume and assortment of spare parts, their technical specifications, and strict legal requirements in various countries, along with challenges in finding dealers, have necessitated changes in how manufacturers handle spare parts.

For timely and quality vehicle maintenance, manufacturers have recognized the need to revise their approaches to supplying spare parts to their customers. Leading automotive companies have therefore developed networked warehouse systems, implemented inventory management at dedicated storage facilities, and established scientific frameworks for analyzing and forecasting demand for spare parts. These systematic approaches to sales and comprehensive computerization have significantly reduced storage costs and accelerated customer service.

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In line with recommendations from international quality standards (ISO-9000 series), automobile manufacturers do not introduce their products into new markets without first establishing full-service centers for warranty support and spare parts supply. Failing to do so risks losing market share due to subpar service quality, thereby benefiting competitors.

Results and discussion

SUPPLIERS FOR AUTOMOBILE ASSEMBLY LINES: SPARE PARTS AND COMPONENTS MANAGEMENT

Suppliers providing spare parts and components for automobile assembly lines operate on similar principles globally. Most automobile manufacturers organize vehicle assembly directly at their facilities while relying on these suppliers for the necessary inputs.

To ensure the successful sale of vehicles, manufacturers focus on establishing a robust network that supports advertising, spare parts supply, and technical maintenance services. These networks comply with consumer protection laws, providing services during both the warranty and post-warranty periods. Consequently, supply chains are optimized to ensure next-day delivery of spare parts to repair shops or customers anywhere in the market.

A well-designed supply system ensures the uninterrupted operation of assembly lines while enforcing stringent penalties for non-compliance or dishonest suppliers. This system facilitates the precise delivery of required components in the correct quantity, nomenclature, and within specified timelines, thus enabling a "flexible" production process that quickly adapts to the production of new models.

THE ROLE OF ELECTRONIC SYSTEMS IN SUPPLY CHAIN OPTIMIZATION

To manage vast amounts of data and improve decision-making efficiency, automobile companies worldwide invest heavily in electronic computing systems. These systems automate data processing, optimize warehouse network structures, and control inventory across multiple storage locations.

Central warehouses often include a computing center with the following functions:

- Determining inventory levels,
- Registering orders,
- Tracking costs,
- Monitoring stock replenishment
- Overseeing spare part usage.

Spare parts stored at different warehouse levels are classified using demand and cost-based methods. The most widespread approach divides spare parts nomenclature by demand levels into A, B, and C (or X, Y, Z) groups:

Group A: Represents approximately 20% of spare part nomenclature but accounts for 85% of total demand.

Group B: Comprises about 20% of nomenclature, contributing 10% of demand.

Group C: Constitutes around 60% of nomenclature, fulfilling only 5% of demand.

The cost-based classification involves grouping spare parts into X, Y, and Z categories based on their share in the total cost:

Group X: Constitutes 65% of the total cost, typically 2% of a vehicle's price.

Group Y: Accounts for 25% of the cost, typically between 0.1% and 2% of the vehicle's price.

Group Z: Covers 5% of the cost, usually less than 0.1% of the vehicle's price.

This dual classification approach helps optimize inventory by allocating storage resources proportionally to demand and cost significance.

CLASSIFYING SPARE PART INVENTORY

Table 1: Spare Part Demand Classification by Quantity and Turnover

Impact Factor: 9.9 ISSN-L: 2544-980X

Demand Group	Nomenclature (%)	Units Sold (per item)	Turnover Share (%)
A	20	>50	85
B	20	>10	10
C	60	≤10	5

Spare parts classified under Group A have the highest insurance stock levels to meet variable demand. Group B parts maintain moderate stock levels, while Group C requires minimal or no insurance stock.

Table 2: Spare Part Inventory Classification by Reserve Levels

Reserve Group	Nomenclature (%)	Reserve Value (per item)	Reserve Share (%)
X	9	>2	75
Y	19	0.1–2	20
Z	72	<0.1	5

The optimal reserve levels for each spare part depend on the demand intensity distribution within the classification groups. Monitoring and replenishment frequency also varies:

A-Group: Weekly monitoring for critical items with high demand.

B-Group: Monthly monitoring for moderately used parts.

C-Group: Quarterly monitoring for low-demand items.

STATISTICAL DATA: SPARE PART TRADE AND DISTRIBUTION

During January–October 2024, the wholesale and retail trade turnover of motor vehicles and spare parts (excluding repair and technical services) amounted to **5,613.1 billion UZS**, reflecting a 45.9% increase compared to the previous year.

Large enterprises contributed **2,528.1 billion UZS** with a growth rate of **149.0%**.

Small businesses and private entrepreneurs generated **3,085.0 billion UZS**, showing a **3.9% increase** in sales volume.

This data highlights the growing demand for spare parts and the critical role of efficient inventory management systems in supporting the automotive industry's development.

Drawing insights from the spare parts supply systems utilized by leading international automotive corporations such as **Ford**, **Fiat**, **Volkswagen**, and **International Harvester**, which leverage advanced systems like **"Speed"** and **"Komputair"**, a specialized supply framework has been developed. This proposal is tailored to address the specific operational and environmental needs of the automotive sector in Uzbekistan.

This system outlines the specific features of spare parts supply. Namely, in the warehouse of a dealership center providing services for automobiles, a one-week stock of spare parts from Groups A and B (X and Y) is maintained. Group A spare parts make up 85-90%, while Group B spare parts account for 10-15%. In regional warehouses, a one-and-a-half-month stock of all spare parts from Groups A, B, and C (X, Y, and Z) is stored. Correspondingly, Group A constitutes 60-80%, Group B accounts for 14-26%, and Group C makes up 4-14%.

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In the central spare parts warehouse, a three-month stock of spare parts from all groups is maintained. The system is designed to ensure an uninterrupted supply process of spare parts and prevent unnecessary or rarely used parts from accumulating in dealership centers. This approach avoids occupying extra space and tying up funds unnecessarily. Additionally, all participants are intended to be connected to a unified computerized system.

If the stock of a spare part at the dealership falls below the normative reserve, information is sent via the computer system to the "Main Computing Center." Based on this, the required spare parts are delivered to the dealership within 24 hours for urgent requests or within three days for standard requests.

The supply of spare parts not manufactured in our country is carried out exclusively through the "Central Spare Parts Warehouse." These parts are procured from foreign enterprises based on the demand from the "Main Computing Center" and delivered to the central warehouse accordingly.

In this system, the "Main Computing Center" is established at the automobile manufacturing plant, where all demands for spare parts are collected and analyzed. As a result, detailed information about the number and quality indicators of failures during the operation of manufactured vehicles is obtained. This data allows for the collection of sufficient information and factors to improve the operational reliability of vehicles. Additionally, it creates an opportunity to organize high-quality and efficient service for vehicles, thereby increasing trust in Chevrolet automobiles.

To determine the volume of spare parts needed, all factors affecting frequently used components are automatically taken into account. A complex system calculates the actual consumption of spare parts and determines the stock volume required for a specific period with high precision, considering certain operational factors.

Issues Identified in the Current Spare Parts Supply System for Auto Service Enterprises in the Republic:

Lack of Management and Planning Systems: The absence of a centralized approach to managing spare parts supply for auto service enterprises and analyzing the required spare parts quantities.

No Centralized Distribution System: There is no centralized system for distributing spare parts to auto service enterprises, dealership centers, and spare parts stores. This leads to spare parts being delivered with insufficient reliability and quality.

Lack of Data on Spare Parts Requirements: There is no precise information on the types and quantities of spare parts (A, B, C groups) needed.

No System for Estimating Frequently Used Parts: A mechanism for estimating the volume of frequently used spare parts through the manufacturing plant is absent.

Availability Issues for Certain Models: Some spare parts for specific car models are unavailable, and ordering these parts requires excessive time and financial resources.

Conclusion

Based on the above, it is essential to establish a centralized system for analyzing spare parts supply to auto service enterprises in the Republic. This system should ensure the delivery of only the necessary spare parts through integration into a unified computerized network.

References

1. Resolution of the President of the Republic of Uzbekistan dated July 18, 2019, "On Additional Measures for the Accelerated Development of the Automotive Industry of the Republic of Uzbekistan," Decree No. PQ-4394.
2. Methodology for Calculating the Volume of Spare Parts Needs in the Auto Transport Enterprises of the Republic. Central Asian Research Journal for Interdisciplinary Studies (CARJIS). Google Scholar www.carjis.org. DOI: 10.24412/2181-2454-2022-10-343-350. Volume 2, October 2022.
3. Musajonov M.Z. Basics of Designing Auto Service Enterprises. Tashkent: Tamaddun Publishing House, 2017.

Impact Factor: 9.9 ISSN-L: 2544-980X

4. Polvonov A.S. Basics of Designing Auto Service Enterprises: A Textbook for Higher Education Institutions. Namangan: USMON NOSIR MEDIA, 2023. - 283 pages.
5. A.Polvonov, N. Abdusattorov, M. Saidiyusupov. “Experience of Organizing the Production Technical Base (PTB) of Auto Service Enterprises in Our Republic and Foreign Countries.” International Conference on the Topical Issues of Import-Substituting Product Manufacturing Using Local Raw Materials in the Ferghana Valley Regions. Namangan, October 27-28, 2018. – Pages 38-43.
6. A.Polvonov, N. Abdusattorov, M. Saidiyusupov. “Methodological Foundations for the Rational Development of Auto Service Enterprises.” Collection of Materials of the Republican Scientific-Practical Conference on Modern Information and Communication Technologies in Education: Problems and Solutions. Namangan, May 24-25, 2018. – Pages 128-129.
7. Sharipov K., Polvonov A., Abdusattorov N., Soataliyev D. “Theoretical Aspects of Territorial Location Modeling of Automobile Service Enterprises.” The Seybold Report. ISSN 1533-9211 DOI: 10.5281/zenodo.6969377. V17.I08.2022. – Pages 476-483.
8. A.Polvonov, N. Abdusattorov, D. Soataliyev. "Implementation of Auto Service Enterprises Placement Tasks Based on Simulation Model Software." NamMQI Scientific Journal of Mechanics and Technology, Issue No. 1(6), 2022. - Pages 71-77.
9. Sharipov K., Polvonov A., Shotmonov D., Abdusattorov N. "Optimized Computer Experiments for Developing Territorial Placement Plans of Auto Service Enterprises." NamMQI Scientific Journal of Mechanics and Technology, Issue No. 1(6), 2022. - Pages 50-58.
10. Polvonov A.S., Abdusattorov N.A. "Ways to Improve Car Service Enterprises." Global Symposium on Humanity and Scientific Advancements, Jacksonville, Florida, USA, May 30, 2022.
11. Polvonov A.S., Abdusattorov N.A., Sulaymanov D.C., Odilov J.A. "Optimizing the Working Capital of Spare Parts in Auto Service Enterprises." Western European Journal of Modern Experiments and Scientific Methods, Volume 2, Issue 12, December 2024. Western European Studies.