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Strategic Aspects of Enhancing Automotive Service Competitiveness Through Optimization of Polishing Technological Processes

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Abstract: *The relevance of this study is driven by increasing competition in the automotive service market, growing consumer demands for service quality and result consistency, and the need to improve the operational efficiency of automotive service enterprises under resource constraints. Under these conditions, polishing technological processes acquire strategic importance, as they directly affect consumer value, service reputation, and the formation of long-term competitive advantages.*

The purpose of the article is to provide a scientific rationale and to formulate strategic approaches to enhancing the competitiveness of an automotive service enterprise through optimization of polishing technological processes, taking into account service quality requirements, resource efficiency, and the stability of technological outcomes.

The study employed a systems approach to analyze polishing processes as a component of automotive service production activities, structural and functional

analysis to identify organizational and technological features of their implementation, as well as logical-analytical generalization and comparative analysis to assess the impact of technological parameters on service quality and efficiency indicators.

The results demonstrate that the competitiveness of an automotive service enterprise is largely determined by the level of controllability and reproducibility of polishing processes, rather than solely by technical equipment. It was shown that optimization of key technological parameters of the polishing process reduces result variability, decreases indirect costs, and improves the stability of service quality. Key scientific and practical challenges of optimization were identified, including technological variability of paint coatings, subjectivity of operator decisions, difficulties in formalizing qualitative indicators, and enterprise resource constraints.

The conclusions substantiate the feasibility of implementing strategic approaches based on process standardization, technological specialization, and improved resource efficiency as instruments for developing sustainable competitive advantages in automotive services.

Future research perspectives are associated with the development of methods for quantitative assessment of polishing quality, improvement of models for managing technological parameters, and the introduction of digital tools for monitoring and optimizing automotive service processes.

Keywords: *automotive service quality, process-oriented management, operational efficiency, technological standardization, controllability of production processes, service differentiation, resource efficiency.*

Стратегічні аспекти підвищення конкурентоспроможності автосервісу через оптимізацію технологічних процесів полірування

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Анотація: *Актуальність дослідження зумовлена зростанням конкуренції на ринку автосервісних послуг, підвищенням вимог споживачів до якості й стабільності результатів обслуговування, а також необхідністю підвищення операційної ефективності автосервісних підприємств в умовах ресурсних обмежень. У таких умовах технологічні процеси полірування набувають стратегічного значення, оскільки безпосередньо впливають на споживчу цінність послуг, репутацію сервісу та формування довгострокових конкурентних переваг.*

Метою статті є наукове обґрунтування та формування стратегічних підходів до підвищення конкурентоспроможності автосервісного підприємства шляхом оптимізації технологічних процесів полірування з урахуванням вимог до якості послуг, ефективності використання ресурсів і стабільності технологічних результатів.

У процесі дослідження використано системний підхід для аналізу процесів полірування як частини виробничої діяльності автосервісу, структурно-функціональний аналіз для визначення організаційно-технологічних особливостей їх виконання, а також методи логіко-аналітичного узагальнення та порівняльного аналізу для оцінювання впливу технологічних параметрів на показники якості й ефективності послуг.

У результаті дослідження встановлено, що конкурентоспроможність автосервісу значною мірою визначається рівнем керованості та

відтворюваності процесів полірування, а не лише технічним оснащенням підприємства. Доведено, що оптимізація основних параметрів технологічного процесу полірування забезпечує зниження варіативності результатів, скорочення непрямих витрат і підвищення стабільності якості послуг. Виявлено основні науково-практичні проблеми оптимізації, пов'язані з технологічною варіативністю лакофарбових покриттів, суб'єктивністю виконавських рішень, складністю формалізації якісних показників і ресурсними обмеженнями підприємств.

У висновках обґрунтовано доцільність реалізації стратегічних підходів, що базуються на процесній стандартизації, технологічній спеціалізації та підвищенні ресурсної ефективності, як інструментів формування стійких конкурентних переваг автосервісу.

Перспективи подальших досліджень пов'язані з розробленням методів кількісного оцінювання якості полірування, удосконаленням моделей керування технологічними параметрами та впровадженням цифрових інструментів контролю й оптимізації процесів автосервісного обслуговування.

Ключові слова: *якість автосервісних послуг, процесно-орієнтоване управління, операційна ефективність, технологічна стандартизація, керованість виробничих процесів, диференціація сервісу, ресурсна ефективність.*

Introduction. Under conditions of increasing competition in the automotive service market and rising consumer demands for quality, speed, and consistency of service delivery, the issue of enhancing the competitiveness of automotive service enterprises through optimization of their technological processes becomes particularly relevant. One of the most labor-intensive and, at the same time, critically important processes from the perspective of perceived service quality is the polishing of vehicle body surfaces, which directly affects the aesthetic

characteristics of the vehicle, the durability of paint coatings, and the level of customer satisfaction. Insufficient standardization of operations, variability of technological modes, subjectivity of operator decisions, and inefficient use of material and technical resources lead to reduced productivity, increased costs, and instability of outcomes, which negatively affects the market position of automotive service enterprises.

In this context, optimization of polishing technological processes is considered not only as an engineering and technological task, but also as a comprehensive scientific and practical problem associated with improving operational efficiency, ensuring reproducible service quality, reducing the risk of defects, and forming long-term competitive advantages. Addressing this problem is of significant importance for the development of modern approaches to managing production processes in automotive services, improving methods of technological regulation, and implementing process-oriented models for enhancing the competitiveness of enterprises engaged in vehicle maintenance and repair.

Literature Review. A review of recent studies indicates that the primary focus of scholarly attention is the issue of forming competitive advantages of automotive service enterprises through service quality and the technological level of service operations. In particular, Ye. Smyrnov and co-authors consider the competitiveness of automotive service enterprises as a multifactorial category in which the quality of technological processes, including surface treatment and finishing operations, plays a decisive role [1]. An analytical assessment of competitiveness management in Ukrainian automotive service enterprises was conducted by M. Horodetskyi, who emphasizes that outdated technological solutions limit opportunities for growth and retention of market positions [2]. R. Maistro and S. Biletskyi demonstrate that under conditions of martial law, technological adaptability and stable quality of service operations, including

polishing, are key factors of the economic resilience of automotive service enterprises [3].

A considerable body of research is devoted to the optimization of internal automotive service processes and the improvement of service system efficiency. In particular, K. Zehra et al. examine the optimization of automotive enterprises' operations through the integration of the overall equipment effectiveness indicator, which allows a comprehensive assessment of the coherence of technological operations, process stability, and resource utilization as key factors for improving efficiency and competitiveness [4]. A. Titu et al., based on modeling of service processes in an automotive service enterprise, demonstrate the potential for reducing time and resource expenditures without loss of quality, which is of direct relevance to polishing operations as a resource-intensive stage of service delivery [5]. In addition, J. Patalas-Maliszewska et al. analyze the level of adoption of additive technologies in metallurgical and automotive enterprises, emphasizing the potential for integrating manufacturing technologies into service processes, particularly in surface preparation and treatment [6].

A distinct group of studies focuses on improving surface treatment and polishing technologies as instruments for enhancing service quality. In particular, A. Caggiano and colleagues substantiate the effectiveness of automated laser polishing of additively manufactured automotive components, demonstrating its ability to ensure stable surface quality and reduce production costs [7]. K. Chen and co-authors propose models for establishing target parameters of multistage grinding and polishing processes, which creates prerequisites for the standardization and controllability of these operations [8].

Alongside technological aspects, contemporary studies pay considerable attention to strategic and market factors of competitiveness that indirectly determine

the feasibility of optimizing polishing processes. Thus, V. Maslianchuk analyzes the psychological mechanisms of interaction between asymmetric partners in business ecosystems, which allows high technological service quality to be interpreted as a tool for strengthening partnership positions [9]. K. Lapuzina examines barriers to entry for small producers into organized retail trade, emphasizing the role of product and service quality as an important competitive advantage [10].

M. Krytskyi presents an economic model of creative entrepreneurship in the United States furniture industry that can be extrapolated to automotive services with respect to the combination of traditional technologies and high-quality surface finishing [11]. V. Levit analyzes ESG strategies and their impact on brand value, emphasizing the importance of quality and aesthetics as components of long-term competitiveness [12]. Ye. Hrushko demonstrates the decisive role of brand trust in the United States and Europe, which indirectly confirms the importance of stable quality of service operations [13]. M. Bogopolskyy examines the aesthetic economy as a factor influencing the choice of commercial spaces by Generation Z, highlighting the relevance of high-quality surface treatment for automotive service activities as well [14].

Identification of Previously Unresolved Aspects of the General Problem. Despite the availability of studies in the field of polishing technologies and automotive service management, the issue of a comprehensive consideration of polishing processes as a strategic factor in the competitiveness of automotive service enterprises remains insufficiently addressed in the scientific literature. Aspects requiring additional attention include the relationship between technological polishing parameters and indicators of service quality and efficiency, as well as problems related to organizational and technological variability, subjectivity of operator decisions, and resource constraints of enterprises.

The proposed study is aimed at filling these gaps through a systematic analysis of polishing processes, assessment of their impact on the competitive advantages of

automotive services, and substantiation of strategic approaches to their optimization. The obtained results form a scientific basis for improving the controllability of technological processes and enhancing the competitiveness of automotive service enterprises.

Formulation of the Article Objectives. The purpose of the article is to develop strategic approaches to enhancing the competitiveness of an automotive service enterprise through optimization of polishing technological processes, taking into account service quality requirements, resource use efficiency, and the stability of technological outcomes.

To achieve this purpose, the following objectives are defined:

1) to analyze the role of polishing technological processes and the organizational and technological conditions of their implementation in the formation of competitive advantages of an automotive service enterprise;

2) to assess the impact of key polishing process parameters on indicators of quality and efficiency of automotive service operations and to identify the main scientific and practical challenges of their optimization;

3) to substantiate strategic approaches and formulate recommendations for optimizing polishing technological processes in order to enhance the competitiveness of automotive services.

Results of the Study. Under current conditions of development of the automotive service market, polishing technological processes acquire strategic importance in the formation of enterprise competitive advantages, as they directly influence customer perception of service quality, the level of service differentiation, and economic performance indicators. Polishing is the final and visually most noticeable operation within the complex of body repair activities, the outcome of which determines the aesthetic appeal of the vehicle, the degree of restoration of the paint coating, and the duration of preservation of the achieved effect. In a highly saturated market of standard automotive services, the quality and stability of

polishing operations become a factor of nonprice competition that shapes customer loyalty and the reputational capital of the enterprise.

Rationally organized and technologically optimized polishing processes ensure a reduction in service time, decreased material consumption, and a lower probability of defects, which collectively enhance the operational efficiency of automotive services and their ability to compete on the basis of quality rather than price dumping (Table 1).

Table 1

Impact of Polishing Technological Processes on the Formation of Competitive Advantages of an Automotive Service Enterprise

Element of the Polishing Technological Process	Nature of Impact on Service Quality	Impact on Economic Indicators	Competitive Effect
Standardization of technological operations	Ensuring reproducible quality of results	Reduction of time and material losses	Increased customer trust and loyalty
Optimization of polishing regimes	Reduction of the risk of coating defects	Decrease in rework-related costs	Differentiation based on quality characteristics
Use of modern materials and equipment	Improvement of visual and operational effects	Increase in the average service transaction value	Formation of a premium service segment
Rational organization of the work process	Reduction of customer service time	Increase in service throughput	Enhanced service-based competitiveness
Personnel qualification	Stability and predictability of results	Reduction of indirect costs	Strengthening of reputational advantages

Source: compiled by the author based on [1, p. 129; 4, p. 708; 7, p. 112; 13]

The functioning of polishing technological processes in modern automotive service enterprises is determined by the level of operation formalization, the coherence of technological regimes, and the organization of the work process. Under conditions of a regulated sequence of actions and clearly defined surface treatment parameters, stability of result quality is ensured, which reduces the probability of paint coating defects and the need for repeated operations [13]. This approach enables automotive services to maintain a predictable level of quality regardless of individual operator characteristics and fluctuations in production workload, which is critically important for building consumer trust and ensuring the reputational stability of the enterprise.

Optimization of polishing technological regimes contributes to the rational use of material and time resources without compromising the operational and aesthetic characteristics of treated surfaces. Alignment of speed settings, abrasive materials, and operation duration within a unified technological cycle creates conditions for reducing indirect costs associated with rework and equipment downtime. At the same time, the introduction of modern materials and technical tools combined with the rational organization of workstations ensures increased service throughput and expansion of the service range without a significant increase in production costs [1, p. 129]. Under these conditions, the role of personnel is transformed from individual carriers of skills into elements of a technological system, within which operator qualifications support predefined process parameters and ensure result reproducibility. The interaction of technological and organizational components of the polishing process forms an integrated mechanism for enhancing the competitiveness of automotive service enterprises, in which service quality, resource use efficiency, and market position represent interrelated outcomes of optimized production activity.

The functioning of organizational and technological aspects of polishing processes in modern automotive services is implemented through coordination of

operations within the overall production cycle, which reduces technological uncertainty and increases the quality level of the final outcome

Table 2

Organizational and Technological Features of Polishing Process Implementation in Modern Automotive Services

Organizational and Technological Aspect	Content and Characteristics	Functional Purpose
Integration of polishing into the production flow	Integration of polishing operations into the overall service technological cycle	Reduction of processing time and coordination of operations
Spatial organization of workstations	Functional zoning and optimal placement of equipment	Reduction of nonproductive movements
Regulation of technological parameters	Specification of processing regimes for different coating types	Ensuring stability of results
Use of specialized equipment	Application of professional machines and materials	Improvement of process controllability
Quality control of intermediate results	Visual and instrumental assessment of surface condition	Prevention of defect accumulation

Source: compiled by the author based on [1, p. 128; 4, p. 710; 5; 7, p. 113]

For example, in certain cases, professional vehicle polishing within a comprehensive auto detailing procedure involves a sequential set of services, including washing, removal of surface contaminants, correction of paint coatings using specialized compounds, and controlled surface treatment regimes aimed at restoring gloss and protecting the paint from external factors. Such a structured technological organization of operations allows the avoidance of repeated correction cycles and ensures predictable service quality indicators, which significantly affects customer satisfaction and the market attractiveness of the service enterprise [15].

Spatial organization of the workstation in accordance with the technological sequence of polishing operations contributes to minimizing nonproductive movement of equipment and vehicles, which in turn reduces overall service time and increases the throughput capacity of the service center. Regulation of technological parameters, such as the type of polishing compound, pad selection, and machine speed characteristics, ensures processing stability for different surface types and reduces result variability regardless of the qualification of individual operators. The use of specialized equipment and tools allows the integration of efficiency and quality requirements, while quality control at intermediate stages of processing ensures timely identification of deviations from technological standards and prompt adjustment of process parameters [5]. Such a comprehensive approach to organizing polishing technological processes under current automotive service conditions creates prerequisites for improving enterprise performance, reducing time and resource expenditures for service operations, and strengthening competitive positions in the market.

Assessment of the impact of key parameters of the polishing technological process on indicators of quality and efficiency of automotive service operations is driven by the need to transition from intuitive operation management to controlled technological influence on outcomes. In contrast to organizational aspects, the decisive factors in this context are process parameters that directly shape the physical and visual characteristics of the treated surface and determine resource intensity and service duration. Variation in speed regimes, material abrasiveness, duration of individual stages, and processing sequence affects not only the achievement of the required level of gloss, but also the depth of paint coating removal, result stability, and the need for additional corrective operations. Under current conditions of automotive service operation, these parameters are regarded as tools of technological control that enable balancing service quality with economic feasibility (Table 3).

Table 3

Impact of Key Parameters of the Polishing Technological Process on Quality and Efficiency Indicators of Automotive Service Operations

Technological Process Parameter	Nature of Impact on Surface Quality	Impact on Service Efficiency
Polishing speed regime	Formation of uniformity and depth of gloss	Variation in operation duration
Abrasiveness of polishing materials	Degree of correction of coating defects	Influence on the number of processing stages
Surface processing duration	Stability and uniformity of results	Level of labor intensity
Sequence of technological stages	Quality of the final appearance	Probability of repeated operations
Process parameter control during operation	Prevention of defects	Reduction of indirect costs

Source: compiled by the author based on [3, p. 31; 4, p. 711; 7, p. 111; 8, p. 1473]

The interaction of key parameters of the polishing technological process in modern automotive services creates a controlled influence on service quality and efficiency, manifested through stability of visual outcomes, duration of operations, and the volume of resource consumption. Adjustment of speed regimes and surface processing duration allows adaptation of the process to the characteristics of different types of paint coatings, reducing the risk of excessive removal of the protective layer and ensuring gloss uniformity [7, p. 111]. The use of materials with varying abrasiveness within a unified technological cycle enables targeted defect correction without the need for repeated operations, thereby reducing the overall vehicle service time. A coordinated sequence of polishing stages, supplemented by ongoing control of process parameters, contributes to achieving predictable results even under variable service workload conditions. Under these circumstances, technological parameters function as instruments for regulating efficiency, allowing

automotive service enterprises to maintain a high level of service quality while optimizing time and material expenditures, which is a decisive factor of competitiveness in the contemporary service environment.

Optimization of polishing processes in the operations of automotive service enterprises is accompanied by a complex set of scientific and practical challenges of both technological and organizational and economic nature. One of the main issues is technological variability caused by the diversity of paint coating types, differences in the physicochemical properties of materials, and the absence of universal processing regimes suitable for all operating conditions. This complicates process standardization and reduces result reproducibility under identical initial parameters [4, p. 713]. A significant limiting factor is the subjectivity of operator decisions, when the selection of polishing regimes, materials, and operation sequences largely depends on individual experience and interpretation of surface condition, which increases the risk of technological errors and uneven service quality. A persistent challenge is the difficulty of formalizing polishing quality indicators, as a substantial portion of outcomes is assessed visually, which limits opportunities for objective control and comparison of the effectiveness of different technological solutions. At the same time, resource constraints of automotive service enterprises, including shortages of time, financial resources, and access to modern equipment, hinder the implementation of optimized technologies and necessitate trade-offs between quality and productivity. An additional challenge is uneven production workload, which complicates adherence to optimal processing regimes and increases the dependence of results on organizational conditions.

Implementation of strategic approaches to optimizing polishing technological processes in order to enhance the competitiveness of automotive services is advisable through a combination of process standardization, technological differentiation, and resource optimization. Strategically justified is the adoption of a process-oriented strategy that предусматриває the formalization of polishing

operations in the form of adaptive technological maps with controlled quality and cost parameters. The application of a technological specialization strategy is also appropriate, focusing on the identification of polishing as a distinct service line with differentiated levels of complexity and quality, which allows avoidance of price competition and supports the creation of added service value.

An important strategic direction is a process quality management strategy based on stepwise control of outcomes and reduction of quality dependence on subjective operator decisions. A resource efficiency strategy is also justified, aimed at optimizing the use of time, materials, and equipment through alignment of technological parameters with production workload. The combined implementation of these strategic approaches ensures the formation of sustainable competitive advantages of automotive services through result stability, cost predictability, and increased consumer value of services.

Conclusions. The article establishes that polishing technological processes are a strategically significant element in enhancing the competitiveness of automotive service enterprises, as they directly influence service quality stability, resource utilization efficiency, and opportunities for market differentiation. It is demonstrated that the controllability and reproducibility of polishing parameters are critical for the formation of competitive advantages based on quality rather than price competition. Key scientific and practical challenges in optimizing polishing processes were identified, including technological variability of paint coatings, subjectivity of operator decisions, difficulties in formalizing quality indicators, and resource constraints of automotive service enterprises. The feasibility of implementing strategic approaches based on process standardization, technological specialization, and improved resource efficiency is substantiated as a means of ensuring stable outcomes and long-term competitiveness.

Future research perspectives are associated with the development of methods for quantitative assessment of polishing quality, improvement of models for

managing technological parameters, and the introduction of digital tools for monitoring and optimizing polishing processes.

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