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LABOR PRODUCTIVITY IN THE GAS TRANSPORTATION SECTOR: SIGNIFICANCE AND IMPROVEMENT STRATEGIES (CASE STUDY OF JSC "UZTRANSGAZ")

Abstract: *the article examines assessment methods and factors affecting labor productivity in the gas transportation sector, using the case of JSC "Uztransgaz" A factor analysis revealed that the main reason for the decline in productivity was the reduction in transported gas volumes, while staff optimization partially offset this effect. The paper proposes strategies for improving efficiency, including digitalization, the implementation of KPI systems, and organizational measures.*

Key words: *labor productivity, KPI, gas transportation sector, SCADA, assessment methods, factor analysis.*

Language: *English*

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Introduction

Modern economy requires constant improvement of efficiency of utilization of all types of resources, and first of all - human capital. In the conditions of transformation of the national economy of the Republic of Uzbekistan and deepening of the processes of reforming strategic industries, the issue of increasing labor productivity is of particular importance. This is explained not only by the need to ensure sustainable economic growth, but also by the task of improving the competitiveness of domestic enterprises in domestic and foreign markets.

Labor productivity is a key indicator of the efficiency of labor resources use and reflects the quantitative and qualitative performance of employees' labor. It serves as a basis for assessing the efficiency of the organization's work, planning wages, making managerial decisions and developing productivity improvement programs. It is especially relevant for capital-intensive and high-tech industries, such as energy and gas transport.

In the Republic of Uzbekistan, systemic measures are taken at the state level to stimulate labor productivity growth. Thus, the Strategy of actions on five priority areas of development of the Republic of Uzbekistan in 2017-2021, approved by Presidential Decree No. UP-4947 of 7 February 2017, separately emphasizes the need to 'develop industrial production and modernize infrastructure in order to increase labor productivity and energy efficiency of the economy'[6]. The continuation of this policy was the Decree of the President of the Republic of Uzbekistan No. UP-158 of 12 September 2023 'On the Strategy 'Uzbekistan - 2030", which sets the task of forming a modern, innovative, productive economy based on the

effective use of human resources and production potential [7].

It is important to consider the methods of labor productivity assessment, because they allow to identify and obtain accurate and objective data on current labor productivity, which is necessary for making informed management decisions. They also help to identify bottlenecks and areas for improvement. They can also help to plan production processes more accurately and predict results, and it is also worth considering that regular monitoring and analysis of productivity can help to motivate employees by providing feedback and recognition of their achievements [2].

There are four methods of labor productivity assessment at the enterprise level and in gas transmission these methods have their own characteristics.

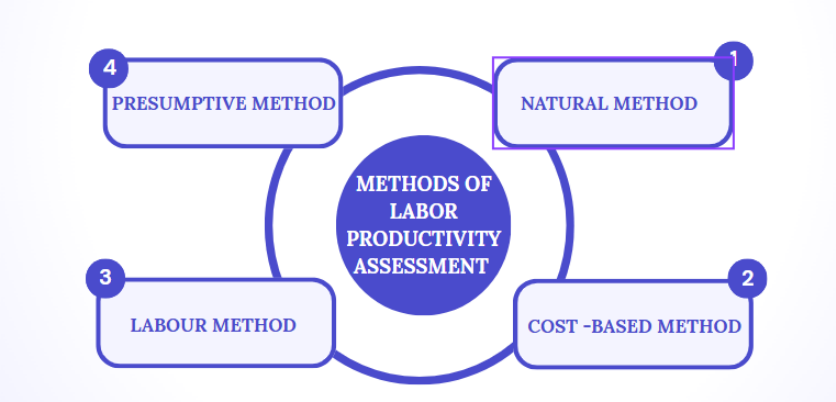

Figure 1. Methods of labor productivity assessment
Source: developed by the authors based on [2]

Natural method: Labor productivity (LP) is equal to the ratio of the volume of transported gas in natural units (cubic metres) to the average number of employees (N).

This indicator does not take into account the length of the route and the technical condition of the pipeline.

$$LP = \frac{Qt}{N} \qquad (1)$$

where, Qt - volume of transported gas, m³, N - average number of employees.

Cost-based method: LP is calculated as the ratio of the cost of transport services (revenue or gross output) to the number of employees.

$$LP = \frac{Qv}{N} \qquad (2)$$

where, Qv - volume of rendered services in value terms, Ch – average number of employees.

Labor method: LP is calculated as labor intensity - the ratio of the number of employees to the number of serviced objects (e.g. kilometres of pipeline, compressor stations).

$$LP = \frac{N}{O}, \qquad (3)$$

where, O - number of serviced units (e.g. kilometres of pipeline or stations), N - number of employees [2,10].

It is worth noting that labor productivity, particularly in the gas transmission industry, is affected by a whole range of factors that can be conditionally divided into technical, organizational, socio-economic, external and human factors (see Table 1).

Table 1- Factors affecting labor productivity in the gas transmission industry [1]

№	Group of factors	Main elements of influence
1	**Technical**	The level of automation and digitalization of processes (SCADA systems, remote monitoring, intelligent control) plays a key role. Modern equipment, energy-efficient technologies and good technical condition of the infrastructure help to reduce labor costs and increase efficiency.
2	**Organizational**	Clear management structure, site coordination, efficient logistics, preventive maintenance, mobile teams, dispatching and the use of digital models. All of these have an impact on smooth operation and staff utilization.

3	**Socio-economic**	The level of remuneration, working conditions, bonus system, availability of PPE and access to training determine employee motivation. The higher the staff satisfaction, the higher the productivity.
4	**External**	The stability of resource supply, price situation, investment climate, government support for the industry, state of infrastructure, regulatory framework and environmental requirements also have a significant impact on efficiency.
5	**Human factors**	Competence, responsibility, safety awareness and staff involvement are crucial. Corporate culture and the psychological climate in the team are also important.

Taking into account the complexity and multifactor nature of this indicator, it is especially important to analyze it comprehensively at specific enterprises of the industry. Uztransgaz JSC, one of the largest and backbone enterprises in the gas transportation sector of Uzbekistan, is a good example in this respect, where the issues of labor productivity improvement are of both practical and scientific importance. The company is responsible for transporting natural gas through the main gas pipelines, managing underground storage facilities and ensuring stable gas supplies both to the domestic market and to export markets. Despite the high level of automation of technological processes, the company's activities are ensured by the labor of a large number of qualified specialists, which means that the assessment of labor productivity has an important applied value, which substantiates the relevance of this paper [8].

In the period from 2021 to 2024, there is a steady tendency of decrease in production and economic indicators at the enterprise, which is especially noticeable in the analysis of labor productivity. Net revenue decreased from 18,381.4 million sums in 2021 to 12,825.5 million sums in 2024, which is a decrease of more than 30%. This decrease occurs against the background of a reduction in the volume of transported gas - from 47,060 million m³ to 36,252 million m³, i.e. by almost a quarter. At the same time, the number of serviced facilities remains practically unchanged, fluctuating between 443 and 449 units, which indicates a stable level of operational load.

Table 2- Labor productivity for 2020-2024

Показатель	**2021**	**2022**	**2023**	**2024**
Net revenue, million UZS	18 381 444	16 588 381	13 500 522	12 825 496
Volume of transported gas, million m³	47060	43550	38160	36252
Number of serviced facilities, units	443	448	449	449
Number of production personnel, persons	7226	6257	6272	6272
Cost-based labor productivity, million UZS/person	2544	2651	2153	2045
Natural labor productivity, million m³/person	6,51	6,96	6,08	5,78
Labor intensity, person/station	16,31	13,97	13,97	13,97

Source: developed by the authors based on the data [3,4,5]

Against the background of the general decrease in the volume of activity and income of the enterprise there is a significant deterioration of labor productivity indicators. Thus, the value labor productivity (revenue per employee) decreased from UZS 2,544 million/person in 2021 to UZS 2,045 million/person in 2024. This reflects a decline in labor efficiency, with less and less revenue per employee.

Natural labor productivity, calculated as the volume of gas transported per production worker, also shows a negative trend: from 6.51 million m³/person in 2021 to 5.78 million m³/person in 2024. This

indicates a decrease in the real contribution of each employee to the main production process.

At the same time, labor productivity (number of employees per station) remains at a stable level of 13.97 persons/station since 2022, which indicates that there are no structural changes in the distribution of personnel by facilities [3-5].

The decrease in the number of production personnel (from 7,226 to 6,272 people) indicates optimization measures, however, they did not lead to productivity growth. On the contrary, the opposite effect is observed, which can be associated with either insufficient automation of processes or deterioration of the technological and organizational component of labor.

Thus, negative labor productivity dynamics is observed in all key areas, especially pronounced in 2024. The main reasons are:

- decrease in gas transmission volumes;
- decline in net revenues;
- limited effect of staff reductions;
- lack of tangible results from the expansion of the infrastructure base.

For a deeper understanding of the reasons for changes in the level of labor productivity in Uztransgaz JSC for 2021-2024, a factor-by-factor analysis by chain substitution method was carried out. The main indicator used is natural labor productivity measured in the volume of transported gas (million m³) per one production worker.

In the period under consideration, labor productivity decreased from 6.51 million m³/person in 2021 to 5.78 million m³/person in 2024, i.e. by 0.73 million m³/person. To identify the reasons for this decrease, two main factors were analyzed: changes in the volume of gas transported and the number of production personnel.

At the first stage of the analysis the impact of the volume of transported gas was determined. If we assume the number of personnel in 2021 to be constant (7,226 people), but substitute the actual gas volume in 2024 (36,252 million m³), the productivity will be 5.02 million m³/person. Consequently, the reduction in gas volume resulted in a reduction in labor productivity of 1.49 million m³/person. This means that the reduction in transport volumes led to a 204% drop in productivity from the total drop.

In the second step, the impact of a change in headcount is assessed. This is done by comparing the two estimated productivity for the same gas volume (36,252 million m³) but with the number of employees in 2021 and 2024, respectively. If the 2024 gas volume is divided by the 2021 headcount (7,226 employees), the productivity is 5.02 million m³/person. At the same time, with the actual 2024 headcount (6,272 employees), the productivity reaches 5.78 million m³/person.

Thus, the reduction in the number of employees between 2021 and 2024 has increased productivity by 0.76 million m³/person, which is about -104% of the total reduction. This means that the staff optimization partially offset the larger drop caused by the reduction in transported gas volumes [3-5].

Based on the conducted factor analysis, it was found that the key factor of labor productivity reduction in Uztransgaz JSC in the period from 2021 to 2024 was the reduction in volumes of transported gas. At the same time, the reduction in the number of production personnel had a compensating effect, partially neutralizing the negative impact of reduced volumes.

To increase the level of labor productivity at the enterprise, it is necessary to implement a set of interrelated technical, organizational and personnel measures aimed at eliminating existing constraints, improving the efficiency of resource use and activating internal reserves.

1. Reducing process losses through digitalization

One of the key factors limiting labor productivity growth is process losses of natural gas. According to the company's ESG report for 2023, such losses amounted to 0.58% of the total volume of gas transported, or about 266 million m³. The main causes are deterioration of pipelines, leaks at joints and outdated monitoring systems, which leads to additional costs and lower specific labor efficiency.

In response to these challenges, the investment project ‘Modernization of the Gas Transmission System of the Republic of Uzbekistan with the Introduction of a Centralized SCADA System’ is being implemented. It provides for the installation of digital pressure, flow and temperature sensors, automated control units and real-time wireless data transmission systems. Already in 2023, the modernization of eight key areas has reduced losses by 16% compared to 2022. It is predicted that after full SCADA integration, the loss rate will drop to 0.3%, which is equivalent to an additional transport of up to 130 million m³ of gas without increasing costs. Thus, SCADA implementation is one of the most important tools for increasing labor productivity [3].

2. Optimization of headcount and flexible personnel management

It is necessary to continue the work on optimization of personnel headcount taking into account the actual scope of work. It is recommended to introduce a flexible personnel planning system adapted to seasonal fluctuations and the current load on the facilities, with the possibility of redistributing employees between sites.

3. Introduction of KPI system as a motivation tool

In order to increase personal responsibility and labor efficiency of employees, it is proposed to introduce a system of key performance indicators (KPI) linking the level of remuneration to the

achieved results. This will increase employee involvement and ensure fair differentiation of wages.

4. Staff development and training

Productivity growth is impossible without training personnel to work in the conditions of digitalization and new technologies. It is necessary to implement training and development programs in the areas of SCADA, maintenance, energy saving and occupational health and safety.

5. Operational efficiency and lean production

Additionally, it is recommended to introduce elements of lean production - optimization of MRO regulations, dispatching of crews, reduction of equipment downtime and logistics losses. This will provide internal growth reserves without significant investments.

Thus, increasing labor productivity in Uztransgaz is possible only with a systematic approach: technical modernization, KPI management, flexible personnel policy, training and lean technologies should be applied interconnectedly. Only in this case it is possible to achieve sustainable efficiency growth and reduce labor costs per unit of production activity.

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