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Impact of digital transformation on labor productivity in oil and gas extraction industry during well construction

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Abstract

The need to implement remote online monitoring technology of drilling operations that produces positive effects on business processes and considerably improves the end-use efficiency of production systems is explored. The improvement of drilling efficiency provides an opportunity to increase cost-effectiveness of existing oil reserves and exploit deposits with hard-to-recover oil and gas reserves. The analysis presented in the article highlights that one of the most significant challenges faced by the sector's development deals with the deterioration of the Russian oil industry, caused by ongoing technology obsolescence and outmoded equipment. Oil and gas companies, which are systematically introducing digital technologies not just to address specific issues but to solve problems at every production stage, greatly increase their level of profitability; have significantly higher indicators of cost benefit, as well as a high level of competitiveness in the international energy market.

*Keywords***:** Digital transformation, oil and gas industry, well construction, online monitoring of drilling, economic growth, labor productivity;

1. Introduction

In the modern Russian economy, gains in labor productivity in oil and gas industry, is a key for the stable growth of economic indicators and it is one of the fundamental priorities for sustainable, long-term economic development of the country [3]. During the financial crisis, amid a decline in production volumes and a fall in world oil prices, the role of the introduction of advanced digital transformation technologies in the oil and gas sector of the Russian Federation is increasing, affected the growth of labor productivity. The cost and complexity of the digitalization strategy's effective implementation, in the current resource-intensive environment, had stifled the implementation progress and the adaptation of technologies in production. Today we see growing number of companies implementing the latest technical advances that represent positive support for business processes and improve the efficiency of end-use of production systems [2].

At the development stage of industry, one of the most important problems is the deterioration of Russia's oil complex, which is influenced by aging of technologies in logistics base, used by the equipment. Within the oil and gas sector, there is a complex of systemic tasks, new challenges that should be taking into account of a mixed economy peculiarities, gained experience, material and

technical base. There is a natural dynamics of current large-scale deposits depletion, the mining facilities are becoming technically more complex, economic costs are arising. Today, the discussion is not about the readiness, but the need to implement digital management of oil and gas wells construction, aimed at increasing labor productivity [4].

2. Research methods

An information database research was made up of data from the Gazprom Neft Scientific and Technical Center. The study analyzed the success indicators of the implementation of online drilling monitoring technologies in an oil and gas company. The study used a statistical method of data analysis. The work is aimed at possible ways of determining and using the results of fundamental research.

3. Results

For effective growth of economic profit, an oil producing company should reduce costs by minimizing the opportunity costs associated with low labor productivity during well construction [1]. The main principle of online monitoring technologies is high-performance control, round-the-clock control over changes in geological and technological parameters of well drilling. Experts real-time monitor drilling equipment and such indicators as: bottomhole depth, drilling speed, bit rotation, trajectory, which are changed depending on the characteristics of coal, which makes it possible to determine quickly the composition of the rock as well as track the data of logging sensors during drilling. If the preset parameters are deviated, digital signals are transmitted to the database server of the monitoring center and inform specialists about it. Also, the data from the logging sensors are tracked in the drilling process.

The implementation of Online Remote Monitoring technologies increases the growth of labor productivity and effectively reduces temporary losses during well construction. So, Table 1 presents economic efficiency by using of Online Remote Monitoring at PJSC Gazprom Neft [5]:

Table 1. Economic efficiency of Online Remote Monitoring

Economic efficiency	Indicators
Reduced well construction time	15%
The Effect of Economic Factor on a well drilling	5 million, rub
Shortening timeline for the launch	12 to 6 years
Online Remote real-time monitoring capabilities	+700 wells per year
The effect of economic factor of Online Remote real-time monitoring, 700 wells per year	3 billion, rub

There is revealed high economic efficiency from the full-scale implementation of digital technologies in the study of the Gazprom Neft Scientific and Technical Center data. In particular, the combined savings from the project implementation is a billion rubles. High economic indicators were achieved to reduce financial costs associated with time savings for wells' construction.

4. Conclusion

The trend towards developing and implementing of digital technologies is increasing in the oil and gas sector of the Russian Federation. Oil and gas producing companies that are introducing digital technologies at every stage of production, and not only for solving individual tasks, significantly increase the profitability level of their work, have significantly high effect of economic factor, and also a high level of competitiveness in the global energy market. In view of the importance of oil and gas sector in the modern economy, initiatives under way provide the basis for economic development in the future, which will allow us to form our own technological base. Increasing drilling efficiency makes it possible to increase the reserves' profitability and to develop more complex fields with hard-to-recover oil and gas reserves. The use of digital solutions in the practice of companies has particular relevance in the anti-crisis development model of the oil and gas sector of the Russian Federation, in order to reduce costs and ensure the development of high-quality internal economic indicators of enterprises, affected the country's economy.

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