

# Justification Of Operational Indicators Of Career Excavators Based On Resource-Saving Technical Solutions.

**Abduazizov Nabijon Azamatovich**

*Doctor of Technical Sciences, Professor*

Navoi State Mining and Technology University

**Niyetbayev Arislanbek Dawletbay uli**

**Jumabayeva Guljaxan Jaksilikovna** *assistant*

Nukus State Technical University

nietbaevarislanbek@gmail.com

+998905770868

**Abstract:** In conditions of increasing competition and the need to reduce costs, resource-saving technical solutions are becoming key to improving the operational performance of quarry excavators. Let's consider the main aspects and justifications for implementing such solutions.

**Keywords:** *Process Automation, Process Modeling, Simulators, GPS Navigation*

## 1. Increasing energy efficiency

**Problem:** High operating costs for fuel and energy resources.

**Solution:** Implementation of modern engine and hydraulic control systems using technologies such as:

**Intelligent control systems:** They adapt the excavator's operation depending on current conditions (load, soil type), which allows optimizing fuel consumption.

- Energy-saving hydraulic systems: For example, using variable-performance pumps that allow for reduced energy consumption under low loads.

## 2. Wear resistance

**Problem:** High level of wear of working parts and other components of excavators.

**Solution:** Application of new materials and technologies:

- Wear-resistant coatings: Using special materials such as ceramics or composites that extend the service life of working parts.
- Improved lubrication system: Implementation of automated lubrication systems that reduce friction and wear.

## 3. Process automation

**Problem:** Human factor and potential operator errors.

**Solution:** Automation and robotization:

- Automatic control systems: Implementation of systems that allow performing certain operations without human intervention, which reduces the risk of errors and increases productivity.
- Remote monitoring: Using sensors and IoT technologies to monitor the excavator's condition in real time, which allows for the timely detection and elimination of malfunctions.

## 4. Logistics optimization

**Problem:** Low efficiency of material and consumable materials movement.

**Solution:** Improving planning and logistics:

- Process modeling: Using software to model excavator operation and plan their routes, which allows optimizing work time and minimizing downtime.
- Synchronization of work with other machines: Coordinating excavators' work with other quarry machines to increase overall efficiency.

**5. Ecological aspects**

*Problem:* Environmental impact and strict regulation.

*Solution:* Implementation of environmentally friendly technologies:

- Emissions reduction: Using hybrid or electric excavators that reduce CO<sub>2</sub> emissions and noise.
- Eco-materials: The use of materials that reduce environmental impact and comply with environmental standards.

**6. Training and qualification of operators**

*Problem:* Low qualification of operators can lead to inefficient work of excavators.



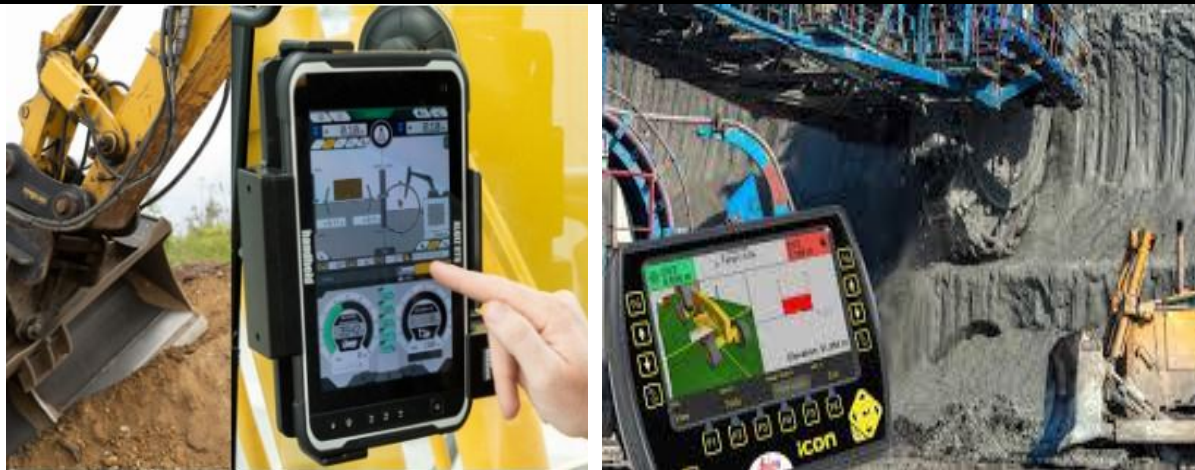
*Solution:* Training and professional development:

- Simulators: Using simulators to train operators allows them to practice skills without the risk of equipment damage.
- Regular professional development courses: Implementing regular training programs that will help operators stay informed about new technologies and work methods.

**7. Application of intelligent systems**

*Problem:* Lack of information about the current state of the equipment and its performance.

*Solution:* Integrating intelligent systems:



- Real-time monitoring systems: Installation of sensors that collect data on productivity, fuel consumption, and equipment condition, allowing for prompt response to problems.
- Big Data Analytics: Using collected data to analyze performance and identify areas for improvement.

### 8. Innovative technologies

*Problem:* Limited capabilities of traditional excavators.

*Solution:* Implementation of new technologies:

- 3D modeling and GPS navigation: These technologies allow for accurate planning and execution of work, which reduces time and the amount of overspent resources.
- Autonomous Driving Technologies: Automating excavator operation using autonomous systems can significantly reduce labor costs and improve safety.

Reduction of maintenance costs

*Problem:* High costs for equipment maintenance and repair.

*Solution:* Forecasting and planning:

- Forecast analysis: Using data to predict possible failures and plan preventive repairs, which reduces unexpected downtime.
- Improving spare parts systems: Optimizing logistics and inventory management to ensure availability of necessary parts.

### 10. Improvement of excavator design

*Problem:* Inoptimal excavator design can lead to insufficient efficiency.

*Solution:* Engineering improvements:

- Lightweight materials: Using lightweight and durable materials for excavator construction, which increases their maneuverability and reduces fuel consumption.
- Aerodynamic design: Optimizing excavator shapes to reduce air resistance and improve fuel efficiency.

### Conclusion

The implementation of resource-saving technical solutions for quarry excavators allows for a significant increase in their operational performance. Energy efficiency, wear resistance, process automation, logistics optimization, and environmental aspects all contribute to cost reduction and overall productivity improvement. The application of modern technologies not only provides economic benefits but also contributes to sustainable development in modern market conditions. Implementation of resource-saving technical solutions in the operation of quarry excavators allows for a significant increase in their efficiency and profitability. This requires a comprehensive approach, including training operators, implementing intelligent systems, using new technologies,

and improving machine design. Investing in these solutions not only reduces operating costs but also contributes to the sustainable development of businesses in the face of growing competition and environmental challenges.

### Literature

1. Yeshmurotov N., Ktaybekov M. RELAY PROTECTION AND AUTOMATION OF COMPENSATION DEVICES //Educational Research in Universal Sciences. – 2024. – T. 3. – №. 4 SPECIAL. – C. 109-112.
2. Kurbanbayev M. et al. O'ZBEKISTON OLIY TA'LIM TIZIMIDA SUN'IY INTELEKTNI JORIY QILISH ORQALI TA'LIM TIZIMINI TAKOMILLASHTIRISH: <https://doi.org/10.5281/zenodo.11334901> //International scientific and practical conference. – 2024. – T. 1. – №. 2. – C. 398-402.
3. Rafikova G. et al. Assessment of the economic effectiveness of energy saving measures //AIP Conference Proceedings. – AIP Publishing, 2024. – T. 3152. – №. 1
4. Djalilov A. et al. Research of ultrasonic sensors for measuring water flow in hydromelioration objects //IOP Conference Series: Earth and Environmental Science. – IOP Publishing, 2024. – T. 1390. – №. 1. – C. 012023.
5. Fuzzy MIMO model for efficient control of complex processes with uncertainties and nonlinearities. Mukhitdinov, D, Kadirov, Y., Shamsutdinova, V., Abdullaeva, D., Jumabaev, R.E3S Web of Conferences 525, 2024. <https://doi.org/10.1051/e3sconf/202452505008>
6. Toshov B.R., Khamzaev A.A. Development of Technical Solutions for the Improvement of the Smooth Starting Method of High Voltage and Powerful Asynchronous Motors/AIP Conference Proceedings 2552, 040018 (2023); <https://doi.org/10.1063/5.0116131> Volume 2552, Issue 1; 5 January 2023
7. Kurbanbayev M. A. et al. Energo tizimda yuzaga keladigan yuqori garmonikalarning o'ldiruv transformatorlariga ta'siri //GOLDEN BRAIN. – 2023. – T. 1. – №. 16. – C. 121-126.