MODELS FOR ADAPTING "GREEN STANDARDS" IN THE PROCUREMENT OF EQUIPMENT AND SPARE PARTS FOR THE MINING INDUSTRY

Behzod Bakhtiyorovich Teshayev,
Deputy Head of the Marketing and Electronic Trading Organization Department of the Central Office of NMMC.
E-mail: oybekkhaydaroff@gmail.com

Abstract: *This thesis examines the marketing and economic aspects of adapting international environmental standards to the procurement of heavy equipment and spare parts by mining enterprises. Resource efficiency, energy efficiency, equipment life cycle, total cost of ownership, and the environmental responsibility of suppliers are identified as the primary criteria for evaluating procurement processes. An adaptive green procurement model applicable to the conditions of the Navoi and Almalyk Mining and Metallurgical Companies has been developed. In addition, a Green Procurement Efficiency (GPE) model is proposed to assess the environmental and economic efficiency of equipment and spare-parts procurement. This model contributes to optimizing operational costs, reducing the carbon footprint, and strengthening enterprises' environmental brand reputation in the international market.*

Keywords: *mining industry, green procurement, mining equipment, spare parts, carbon footprint, MTBF, LCA, TCO, remanufacturing, ESG.*

Introduction: Today, the principles of environmental sustainability and responsible production are becoming important factors that determine the competitiveness of industrial enterprises in international markets. The market value of mining products such as gold, copper, and uranium is now assessed not only according to their price and quality but also by the environmental footprint generated during extraction and processing. Therefore, major mining enterprises increasingly need to integrate environmental requirements into the procurement of machinery, equipment, and spare parts.

The Responsible Gold Mining Principles developed by the World Gold Council identify resource efficiency, carbon-emission reduction, and transparent supply chains as key priorities. These requirements encourage mining enterprises to move from traditional procurement systems based on the lowest purchase price towards green procurement models that jointly consider environmental and economic efficiency.

Major industrial enterprises such as the Navoi Mining and Metallurgical Company and the Almalyk Mining and Metallurgical Company extensively use excavators, heavy-duty dump trucks, drilling equipment, and various spare parts. Selecting such equipment and components solely on the basis of their initial purchase price may lead to increased fuel consumption, higher maintenance costs, equipment downtime, and additional carbon emissions in the long term. Therefore, it is important to consider the equipment's emission class, reliability, service life, energy efficiency, and remanufacturing potential during the procurement process.

The purpose of this study is to develop criteria for adapting green standards to the procurement of heavy equipment and spare parts in the mining industry and to propose a model for evaluating their economic and marketing efficiency. To achieve this objective, the study examines international green procurement practices, compares conventional and environmentally responsible procurement approaches, and develops adaptive evaluation criteria suitable for mining enterprises.

Research Methodology

The study employed a systems approach, comparative marketing analysis, and supply chain management methods. The practices of Rio Tinto, BHP, and Caterpillar in green procurement, decarbonization, and spare-parts remanufacturing were examined and adapted to the conditions of Uzbekistan's mining enterprises.

The efficiency of equipment and spare parts was evaluated using MTBF, LCA, and TCO indicators. In addition, emission class, fuel efficiency, service life, and remanufacturing potential were considered. The Green Procurement Efficiency (GPE) model was applied to assess the economic and environmental efficiency of green procurement.[1]

Research Results

The analysis identified the Stage V/Tier 4 Final emission class, a high MTBF value, TCO, LCA, and spare-parts remanufacturing potential as the main green criteria for procuring mining equipment and spare parts. These criteria enable a comprehensive assessment of the environmental impact, economic efficiency, and operational performance of equipment.

The use of engines that comply with Stage V and Tier 4 Final standards reduces atmospheric emissions of nitrogen oxides and particulate matter. This helps enterprises meet environmental requirements, mitigate risks associated with future carbon restrictions, and strengthen their environmental reputation in international markets.[2] Using spare parts with high MTBF values reduces the number of equipment failures and unplanned shutdowns. Extending the service life of spare parts by 20% decreases the number of logistics operations associated with their replacement and delivery.

Consequently, carbon emissions across the supply chain may be reduced by an average of 12%.

The use of equipment that complies with green standards may reduce fuel consumption by 14–18% and extend its operational life from the conventional 8–10 years to 12–15 years. This decreases maintenance, repair, and fuel costs while improving the enterprise's overall operational efficiency.[3]

The implementation of remanufacturing programmes may increase the share of remanufactured spare parts from 5% to 45%. This approach contributes to conserving metal resources, reducing waste, and extending the life cycle of spare parts. Overall, the findings demonstrate that the green procurement model provides environmental benefits while supporting the long-term economic interests of mining enterprises.

Discussion of Results

The findings indicate that assessing green procurement in the mining industry solely on the basis of environmental certifications is insufficient. Certifications such as ISO 14001 confirm that a supplier has an environmental management system; however, they do not fully reflect the actual operational performance of the equipment. Therefore, procurement decisions should jointly consider emission class, mean time between failures (MTBF), fuel consumption, service life, total cost of ownership (TCO), and the potential for remanufacturing spare parts.

The initial purchase price of equipment that complies with green standards may be higher than that of conventional equipment. However, extended service life, reduced fuel consumption, fewer repairs, and less equipment downtime can lower the total cost of ownership in the long term. Therefore, procurement decisions should not be based solely on the lowest purchase price but also on the economic efficiency of equipment throughout its entire life cycle.[4]

The implementation of spare-parts remanufacturing programmes enables the reuse of metal resources and helps reduce industrial waste. The use of spare parts with high MTBF values also reduces logistics operations and enhances supply-chain resilience. These factors contribute to reducing both the company's operating costs and its carbon footprint.

From a marketing perspective, cooperation with environmentally responsible suppliers strengthens the mining company's brand reputation in international markets. The application of green procurement principles increases the company's credibility among investors, customers, and financial institutions. Therefore, the green procurement model can be regarded not only as an environmental requirement but also as a strategic marketing tool that ensures the company's long-term competitive advantage.[5]

Conclusion

The findings demonstrate that implementing a green procurement system in the mining industry ensures not only environmental sustainability but also economic and marketing efficiency. Considering the Stage V/Tier 4 Final emission standards, mean time between failures (MTBF), life-cycle assessment (LCA), total cost of ownership (TCO), and remanufacturing potential when selecting heavy equipment and spare parts can reduce companies' fuel, maintenance, and logistics costs.

The use of highly reliable spare parts extends equipment service life while reducing the frequency of replacements and carbon emissions throughout the supply chain. Remanufacturing programmes also help conserve metal resources, reduce industrial waste, and enable the reuse of spare parts.

Mining companies are advised to include minimum emission standards and MTBF requirements in procurement documents, evaluate equipment based on TCO, and develop long-term partnerships with environmentally responsible suppliers. In addition to improving operational efficiency, these measures strengthen companies' reputations in international markets as responsible and environmentally sustainable brands.

References

1. Kotler, P., Kartajaya, H., Setiawan, I. Marketing 5.0: Technology for Humanity. Wiley, 2021.
2. Porter, M. E. Competitive Advantage: Creating and Sustaining Superior Performance. New York: Free Press, 1985.
3. Keller, K. L. Strategic Brand Management: Building, Measuring, and Managing Brand Equity. Pearson Education, 2013.
4. ISO 20400:2017. Sustainable Procurement — Guidance. International Organization for Standardization, Geneva, 2017.
5. Walker, H., Brammer, S. Sustainable procurement in the public sector: an international comparative study. International Journal of Operations & Production Management, 2012, Vol. 32, No. 4, pp. 452–476.