

THE ECOLOGICAL COMPONENT OF THE PRODUCTION OF REFRACTORIES

Borysenko O.M., Maksymenko D.V.

*National Technical University
«Kharkiv Polytechnic Institute», Kharkiv*

The production of refractory materials plays a key role in the metallurgy, cement, glass and ceramic industries, as it provides protection for equipment operating at extremely high temperatures. However, this sector has a significant environmental impact due to the intensive consumption of natural resources, high energy costs and the generation of industrial emissions.

The main raw materials for refractories are fireclays, magnesite, bauxite and other minerals, the extraction of which entails changes in the natural landscape and disruption of ecosystems. Quarrying is accompanied by deforestation, soil erosion and pollution of water resources. Additional burden on the environment is created by waste from processing raw materials, which often contain toxic compounds and require special disposal methods.

The refractory manufacturing process involves firing at high temperatures, which requires significant amounts of energy. The use of traditional fuel sources such as coal and natural gas results in emissions of carbon dioxide, sulfur dioxide, and nitrogen oxides. These substances contribute to climate change, acid rain, and air pollution. In addition, the processes emit fine particles that impair air quality and may pose a health risk to workers and residents of nearby areas.

To reduce its environmental impact, the industry is gradually introducing more sustainable technologies. The use of secondary raw materials, such as recycled refractory waste, reduces the consumption of natural resources and reduces the volume of industrial waste. The introduction of energy-efficient technologies, including improved furnaces and heat recovery systems, reduces overall energy consumption and reduces emissions of harmful substances.

One of the promising areas is the replacement of traditional carbon-containing fuels with alternative energy sources, including hydrogen and electricity from renewable sources. The use of modern gas cleaning and filtration systems allows minimizing emissions of solid particles and toxic gases, which significantly improves the environmental performance of production.

The future of refractory production involves balancing industrial needs and environmental challenges.