WORLD CONFERENCE ON STUDENT - CENTERED LEARNING APPROACHES

ANALYSIS OF THE WEAR PROCESS OF CONE CRUSHER LINERS AND METHODS TO EXTEND THEIR SERVICE LIFE

M.B. Nasriddinova – Teacher, School No. 8, Navoi City

Annotatsiya. Mazkur tezisda konusli maydalagichlarda qo‘llaniladigan futerovkalarning yeyilish jarayoniga ta’sir etuvchi asosiy omillar tahlil qilingan. Maydalanuvchi tog‘ jinslarining fizik-mexanik xususiyatlari, maydalagichning ish rejimi, futerovka materiali va konstruktiv parametrlarining ekspluatatsion samaradorlikka ta’siri yoritilgan.

Kalit so‘zlar: konusli maydalagich, futerovka, abraziv yeyilish, tog‘ jinslari, maydalash jarayoni, xizmat muddati, yeyilish tezligi, texnik diagnostika.

Abstract. This paper analyzes the key factors influencing the wear process of liners used in cone crushers. It examines the impact of the physical-mechanical properties of the rock being crushed, the crusher's operating mode, the liner material, and design parameters on operational efficiency.

Keywords: cone crusher, liner, abrasive wear, rock, crushing process, service life, wear rate, technical diagnostics.

In mining and metallurgical enterprises, the crushing of rock is a crucial technological stage in mineral processing. Cone crushers stand out in this process due to their high productivity and ability to crush rock of varying hardness.

One of the primary working components of a cone crusher is the liner, which forms the surfaces of the crushing chamber and operates in direct contact with the rock. During operation, the liner gradually deteriorates due to abrasive wear, repeated impacts, high contact pressure, and the uneven distribution of loads across the working surfaces.

Excessive liner wear can lead to changes in the crushing chamber's geometry, instability in the product's particle size distribution, increased energy consumption, and

the need to shut down equipment for repairs. Consequently, systematically studying the wear process and developing methods to extend the service life of liners is of significant scientific and practical importance.

The study involves analyzing the operational performance of cone crushers, examining wear zones on the liner surface, comparing the physical-mechanical properties of materials, and employing methods to assess wear rates. Additionally, mathematical modeling, instrumental measurements, and experimental testing can be used to determine the impact of process parameters on the condition of the liners.

The wear process of cone crusher liners is determined by several interrelated factors. These include the hardness and abrasiveness of the rock being crushed, the crusher's load level, the shape of the crushing chamber, the mechanical properties of the material, and the stability of the operating mode.

Liner wear typically does not occur uniformly throughout the crushing chamber. In certain zones, wear may accelerate due to intense rock movement and high contact pressure.

Consequently, the liner's original geometric shape changes, increasing the likelihood of a deterioration in the technological performance of the crushing process.

The following approaches are important for extending the service life of liners:

1. Identifying and mapping wear zones. A wear map is created by regularly measuring the areas of the liner's working surface subject to the most wear. The data obtained enables the optimization of the liner profile and the scheduling of replacement intervals.

2. Selecting liner material suited to operating conditions. Factors such as hardness, impact toughness, resistance to abrasive wear, and heat treatment capabilities must be considered during material selection. While high-manganese steels can be effective under certain impact loading conditions, the optimal material is chosen based on the crusher type and the characteristics of the rock.

3. Optimizing the crushing chamber profile. It is important to tailor the liner's geometric shape to the size and strength of the material being crushed and the required product fraction. Improving the profile can help enhance rock movement through the chamber, reduce uneven load distribution, and maintain an efficient operating mode.

4. Stabilizing operating modes. It is essential to operate the crusher in accordance with the manufacturer's technical specifications, ensure a steady feed of material, and prevent foreign objects from entering the crushing chamber. Consistent loading reduces the risk of excessive stress developing in specific sections of the liner.

5. Quantitative assessment of wear rate. The wear rate can be determined based on changes in liner thickness or mass over time.

7. Assessment of economic efficiency. Proposed technical solutions should be compared based on liner service life, cost per ton of crushed material, spare parts consumption, and equipment downtime. Such an approach enables the selection of a solution that is both technically effective and economically viable.

Analyzing the wear process of cone crusher liners is a crucial aspect of enhancing the reliability and operational efficiency of crushing equipment. The service life of a liner depends on material properties, the geometry of the crushing chamber, rock abrasiveness, and the equipment's operating mode.

Mapping wear zones, making informed material choices, optimizing the crushing chamber profile, and implementing technical diagnostics expand the potential for the effective use of liners. Evaluating these measures through practical testing helps reduce maintenance costs and ensures the continuous operation of equipment at mining and metallurgical enterprises.

REFERENCES

1. Wills B. A., Finch J. Wills' Mineral Processing Technology: An Introduction to the Practical Aspects of Ore Treatment and Mineral Recovery. 8th ed.

Butterworth-Heinemann, 2016.

2. Hutchings I. M., Shipway P. Tribology: Friction and Wear of Engineering Materials. 2nd ed. Butterworth-Heinemann, 2017.
3. Cleary, P.W.; Sinnott, M.D.; Morrison, R.D.; Cummins, S.; Delaney, W.G. Analysis of cone crusher performance with changes in material properties and operating conditions using DEM. *Miner. Eng.* **2017**, *100*, 49–70. [CrossRef]
1. Chen, Z.; Wang, G.; Xue, D.; Cui, D. Simulation and optimization of crushing chamber of gyratory crusher based on the DEM and GA. *Powder Technol.* **2021**, *384*, 36–50. [CrossRef]