IMPROVEMENT OF BELT CONVEYOR BELT JOINTING TECHNOLOGIES AND ENHANCEMENT OF THEIR RELIABILITY

Haydarov Shohid Bahriddinovich
Navoi State University of Mining and Technologies, Department of Mining Electromechanics, Associate Professor (Acting), PhD
Usmanova Umida Khusniddin qizi
Navoi State University of Mining and Technologies, Master's Degree Student

Abstract: *This thesis examines belt conveyor systems widely used in industrial enterprises, focusing on their structural features and belt splicing technologies.*

Keywords: *belt conveyor, belt splicing, mechanical joint, vulcanization, automation, reliability, monitoring.*

Introduction. Belt conveyors are an integral part of modern industry and are widely used in mining, metallurgy, power engineering, construction materials production, and logistics systems. These installations enable the continuous transportation of bulk and unit loads over long distances with relatively low energy consumption.

The belt, which is the main element of a conveyor system, is constantly subjected to mechanical stresses, friction, dust, moisture, and temperature variations. In particular, belt joint areas are considered the most vulnerable points, where a significant proportion of failures occur. Therefore, improving belt conveyor belt jointing technologies plays a crucial role in increasing operational reliability and overall production efficiency.

Belt conveyors consist of the following main components: the drive and return pulleys; the conveyor belt; idler roller supports; the tensioning

mechanism; and the drive system, which includes an electric motor and a gearbox.



The conveyor belt is manufactured from rubber–fabric, rubber–metal, or multilayer composite materials. Depending on production conditions, the belt length may reach several tens or even hundreds of meters. For this reason, delivering the belt as a single continuous unit is difficult, which makes belt jointing necessary.

In practice, several basic belt jointing methods are used, including the following:

Mechanical jointing – this method is distinguished by its simplicity and rapid installation. It is mainly applied in short-term or temporary conveyor systems. However, under impact and dynamic loads, the reliability of mechanical joints decreases.

Hot vulcanization – hot vulcanization is considered the strongest and most durable belt jointing method. It is widely used in permanently operating conveyors subjected to high loads.

Cold vulcanization – although cold vulcanization technology is characterized by ease of installation, it has limited applicability under high-temperature conditions and in aggressive environments.

Today, industrial production processes require high productivity, safety, and energy efficiency. Therefore, conveyor belt joints must meet increased requirements in terms of strength, reliability, and operational stability.

• high strength;

• elasticity;

• long service life.

Improved belt jointing technologies not only meet these requirements, but also significantly reduce maintenance time and downtime.

Modern directions of improvement include the development and application of advanced composite materials, the optimization of vulcanization parameters, the use of innovative adhesive systems, and the implementation of automated and condition-monitoring technologies aimed at enhancing the reliability and durability of conveyor belt joints.

• the use of new-generation elastomeric and polymer materials;

• application of automated vulcanization presses;

• implementation of modular quick-joint systems;

• use of digital sensors for monitoring the condition of belt joints.

These directions enhance the overall reliability of conveyor systems and ensure the stability of production processes.

Conclusion. Improving belt conveyor belt jointing technologies has significant scientific and practical importance across various industrial sectors. The implementation of modern technical solutions extends the service life of conveyor systems, reduces the frequency of failures, and increases overall production efficiency.

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