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Piotr Bogusław Bortnowski
Dyscyplina: Inżynieria Środowiska, Górnictwo i Energetyka

Streszczenie pracy doktorskiej w języku angielskim pt.: "*Modelowanie pracy taśmowego napędu pośredniego z dodatkowym sprzężeniem ciernym taśm w cięgnie dolnym (Modeling the operation of a belt intermediate drive with additional friction coupling on the return side)*"

Intermediate conveyor drives belong to a specific group of conveyor drive systems whose primary function is to evenly distribute driving forces along the transport route, reducing stress in the main conveyor belt. This principle is based on frictional coupling between the driving belt, which acts as an additional conveyor installed between the carry and return sides of the main belt, with the required pressure provided by the material load. Reducing stress in the driven belt allows for a belt with lower nominal tensile strength, reducing mass and improving energy consumption and conveyor resistance. Even distribution of stress also extends belt life.

In this dissertation, the focus was on modeling and validating an intermediate drive with additional frictional coupling on the return side. Standard drives only consider coupling on the carry side, but this concept aims to increase traction by extending frictional engagement between belts. The goal was to enhance efficiency by introducing this coupling in the lower belt section, allowing more efficient force transmission.

The study included theoretical analysis and experimental validation. Initially, a model was developed to describe force distribution in driving and driven belts for both single-belt and dual-belt configurations, accounting for elastic deformations and slip/adhesion zones. Additionally, a model of velocity changes was developed, enabling simulation of dual-belt performance and analyzing frictional coupling efficiency.

The next stage involved designing a test stand and measurement system to validate the drive. Tests compared single-belt and dual-belt configurations, focusing on frictional force transmission and system stability. Special attention was given to elastic slip in the frictional engagement sections and its effect on the transmitted force and efficiency of the dual-belt concept.

Theoretical and experimental research confirmed the potential of this solution for increasing conveyor system traction, especially for long routes, but only with optimal stress distribution between belts. Under optimal conditions, the dual-belt drive distributes forces more uniformly and improves stability, reducing slip and extending component life.

The dissertation presents both theoretical and experimental results, providing insight into optimal conditions for dual-belt drives and their practical implementation. The key finding is the confirmation of the theoretical assumptions: effective force transmission in this configuration is closely linked to stress distribution in the belts and their elastic moduli, which affect elastic slip. The importance of accurate estimation of moduli in low-tension conditions was also highlighted. Despite some discrepancies between theoretical and measured elastic slip, the results confirm the validity of the models, making this concept a promising solution for improving intermediate conveyor drive efficiency.

Bortnowski