## Accepted Manuscript


# Measurement and Determination of the Absorbed Impact Energy for Conveyor Belts of Various Structures under Impact Loading

Anna Grincova, Miriam Andrejiova, Daniela Marasova, Samer Khouri

PII: S0263-2241(18)30831-5
DOI: https://doi.org/10.1016/j.measurement.2018.09.003
Reference: MEASUR 5861

To appear in: *Measurement*

Received Date: 25 July 2017
Revised Date: 17 August 2018
Accepted Date: 1 September 2018

# Measurement and Determination of the Absorbed Impact Energy for Conveyor Belts of Various Structures under Impact Loading

**Anna Grincova[a], Miriam Andrejiova[b], Daniela Marasova[c], Samer Khouri[c]**

[a]Faculty of Electrical Engineering and Informatics, Technical University of Kosice, Letna 9, 042 00 Kosice, Slovak Republic
[b]Faculty of Mechanical Engineering, Technical University of Kosice, Letna 9, 042 00 Kosice, Slovak Republic
[c]Faculty of Mining, Ecology, Process Control and Geotechnology, Technical University of Kosice, Park Komenskeho 14, 042 00 Kosice, Slovak Republic

**Abstract**
The effect of impact loading at the transfer point is often manifested by mechanical damage to a conveyor belt. To describe the phenomena related to the conveyor belt damage caused by the impact of the material, it is important to monitor the amount of the absorbed impact energy. Therefore, the focus of the present article is on the identification of the effect of the conveyor belt’s structure (textile or steel conveyor belt carcass), as well as the strength, the material’s drop height and the drop weight on the relative amount of impact energy absorbed by a conveyor belt. The result of the article is determining the capabilities of different conveyer belts through the monitoring and the identification of the relationship between the relative amount of the absorbed energy and the selected parameters.

**Keywords:** rubber-textile conveyor belt, steel-cord conveyor belt, puncture resistance, absorbed energy

## 1. Introduction

A rubber conveyor belt with a textile or steel carcass is the most vulnerable structural element in a belt conveyor. At the point of impact of the transported material onto a conveyor belt, the extreme drop heights and sharp edges of the material may result in damage to the cover layers and to conveyor belt punctures [1]. In particular, this regards stones and other bulky materials that cause substantial damage to the machine belts on the excavator which is not detected, and is then transferred downstream to the substations of the belt conveyors and the spreader, where they generate the associated maintenance costs. In a study by Borchart et al. [2] a sensor-based stone detection system was developed on the one hand, and an automatic bulk material discharge system was created on the other hand, with the aim of eliminating such damage to the conveyor belts.

In addition to causing damage to the most expensive element of a belt conveyor, the transportation of materials by belt conveyors is also an energy-intensive industrial application [3,4]. The cost-efficient operation of belt conveyors, just like any other application, requires using accurate plant models with optimised algorithms. When creating such models, the energy model should indicate the amounts of materials that can be transported by the belt conveyors to optimise the costs of the energy. This was determined by Mathaba [5], who assessed the optimal scheduling of conveyor belts (CB) under the Critical Peak Pricing (CPP)