



XTribology

Competence Center for Tribology

Program: COMET – Competence Centers for Excellent Technologies

Program line: K2-Centers

COMET-project 2.11, 2015-2020; service life increase in a tribodynamic wear environment, multi-firm project

24/7, 365 days a year – conveyor belts under extreme conditions

The demanding and competitive environment in the steel industry requires conveyor belt systems to provide 100% reliability and availability under extreme conditions. Commonly used belt lengths vary from several meters to sometimes a few kilometers. Maintaining conveyor systems which are constantly under high load is obviously a significant cost factor. Therefore the goal of this interdisciplinary research project was to increase the service life of the relevant materials and to ensure their proper function for its duration. After identifying the relevant wear mechanisms in real application, they were simulated via a suitable test setup under lab-conditions. Subsequently an evaluation of commercially available belt patterns and prototype belt compositions lead to the development of a new belt type with a 25% increase in service life.



Challenges for conveyor belts

Conveyor belts are the near-ubiquitous solution in today's world for all situations in which large amounts of bulk goods or materials have to be moved: from small everyday applications like a supermarket checkout to enormous industrial efforts like mines that have to transport their product to the nearest port or railway station.

Especially in the steel industry, where tens of thousands of tons of iron ore, lime, coke and pellets have to be moved every day, the resulting demands on conveyor belts are exceedingly high and, accordingly, so is the resulting wear. Furthermore, these belts have to "travel" a distance of around 450,000 kilometres over the course of a year. Any downtime and resulting loss of production in the belt system will cost the company hundreds of thousands of euros.



Lab-2-Field: From model tests to prototype verification

From the very beginning the focus of this project was on the steel industry's desire for a highly wear resistant belt which allows a longer service life of the conveyor system than the current version – ideally at a similar price point. Towards this end an interdisciplinary project team consisting of AC²T (tribology research), the operator, the conveyor belt manufacturer, and a company responsible for assembly and maintenance was created in which the whole value added chain from R&D and production to user application and maintenance was represented.

In order to evaluate the wear resistance of a given setup it was necessary to develop a reliable method for replicating the real world industrial processes under laboratory conditions. The first step towards this goal was to identify the relevant wear sources which turned out to be the free movement (mainly rolling) of the bulk material on the belt and the scraper-belt contact

(with and without bulk). The tribological mechanisms which resulted in material degradation at these contact areas can be classified into two very distinct categories of 2-body-abrasion and 3-body-abrasion. A realistic representation of these two mechanisms in the laboratory required the combination of two different approaches, specifically a pin-on-drum setup and the rubber wheel test. A subsequent analysis of the commercially available conveyor belt samples provided no satisfactory results. None of the samples demonstrated a significantly higher wear resistance or longer service life than the current version.

These results prompted a joint effort to conduct the same analysis on a number of custom rubber mixtures that were developed by a project partner and examined in the laboratory setup created by AC²T. These tests showed an increase in wear resistance of 20% and 34% of the custom-made mixtures over the currently used variant.

On the basis of these results a field test was commissioned with the intent to determine the real service life of this new belt setup. In order to ensure a comparison under identical conditions for the new and the old type a belt was assembled from of 50% either material.

This real field trial showed an increase in wear resistance of the new type compared to the current type of at least 25%. This translated into a service life increase of the belt from currently 6 months to nearly 8 months.



Fig. 1: Conveyor belt application for transportation of goods in the steel industry
(photo: voestalpine Stahl)



Impact & economic benefit

- Construction of a Lab-2-Field setup for evaluating the wear resistance of conveyor belts under lab-conditions
- Identification of real-life wear mechanisms
- Increase of wear resistance and service life for the belt's rubber mixture by about 25%, resp. from 6 months to 8 months

Contact information

K2-Center XTribology

AC²T research GmbH
Viktor-Kaplan-Straße 2/C
T +43 2622 81600
E office@ac2t.at, www.ac2t.at

Project partner

Organisation	Country
voestalpine Stahl GmbH	Austria
Semperit Technische Produkte Gesellschaft m.b.H.	Austria
Wanggo Gummitechnik GmbH	Austria

Project coordination

Dr. Wolfgang MOLNAR

Weitere Informationen zu COMET – Competence Centers for Excellent Technologies: www.ffg.at/comet
Diese Success Story wurde von der Konsortialführung/der Zentrumsleitung zur Verfügung gestellt und zur Veröffentlichung auf der FFG-Website freigegeben. Für die Richtigkeit, Vollständigkeit und Aktualität der Inhalte übernimmt die FFG keine Haftung.