

# Application of Abrasion Depending Life Cycle and Optimal Maintenance Strategies for Belt Conveyor Systems

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**Abstract:** In this paper new methods for stress depending maintenance strategies based on a signal- and observer based system for large scale belt conveyor systems are presented. This new approach will provide much more information about the system conditions and mechanical abrasion to optimize the current maintenance schemes.

Belt conveyors operate under the presence of many disturbances and strong parameter changes caused by the industrial surroundings and the operators are faced with increasing requirements on quality and productivity. New operating strategies should provide both, a high availability and level of safety but on the other hand reducing the maintenance costs. The existing maintenance strategies for mechanical components of belt conveyor systems are static calculation methods of live cycle based on predicted data, without considering the real stress and system states of operation.

Attention of this paper is focused on the development of dynamic calculation methods, using real system data and estimated data provided by the robust observer-based model. This approach include the real mechanical and dynamical strain, e.g. the mass, the torque and the velocity, to optimize the maintenance considering the abrasion depending and dynamic life cycle. The result will lead to both, increase the life cycle of the mechanical parts, in the case of a lower abrasion as predicted or an early substitution of components to avoid malfunction.

In the final version of the paper, we shall present the basic approach of the signal-based system and the effects for the maintenance strategies. The application for the mechanical components idler, gear and driving pulley of a real belt conveyor systems are demonstrated.

## References

- [1] B. van den Heuvel, "Selection of Maintenance and Diagnosis Strategies for High-Capacity Equipment and Belt Conveyors", *Braunkohle Surface Mining*, vol. 3, pp.329-346, 2001
- [2] J. Kowalewski, "Assessment of Remaining Fatigue Life for Surface Mining Equipment", *Braunkohle Surface Mining*, vol. 4, pp.405-416, 2001
- [3] A. Sturm, "Zustandswissen für Betriebsführung und Instandhaltung", Verlag VGB - Kraftwerkstechnik GmbH, 1996
- [4] DIN ISO 281, "Wälzlager - Dynamische Tragzahlen und nominelle Lebensdauer"

- [5] D. Söffker, M. Rinne, "The application of the SRCE - concept for monitoring high speed automotive tires", *Safety and Reliability, Proc. of ESREL'99*, , pp.1083-1089, 1999.
- [6] T. Jeinsch, M. Sader, S.X. Ding, P. Zhang, J. Lam, P. Engel, W. Jahn, R. Niemz, "Application of observer-based monitoring technique in belt conveyor systems", *Proc. of the 15th Triennial IFAC World Congress*, 2002

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