Science 4 Technology – Poster Exhibition 2024

Department Economics and Business Management

Chair of Economics and Business Management

MONTAN UNIVERSITÄT LEOBEN

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Applied Life Cycle-Based Environmental Analysis

A Case Study of Steel-Based Wear Parts

Motivation

- Eco-Design approach prevents harmful environmental impacts of products at an early stage
- Life cycle assessments (LCA) enable analysis of ecological impacts along the supply and value chains
- Recent European legislation upgraded ISO 14040/14044 based LCA significantly

Methodological approach (*of the case study*)

- Reference flow is wear parts used per year
- Simplified "gravel-to-grave" approach considering the pre-processing of steel-materials ("rucksack principle“)
- Local disposal of the discarded wear parts

Results & Conclusion (*of the case-study*)

- Carbon footprint of the wear parts is dominated by the carbon intensity of steel pre-production
- Sheet metal processing can be slightly optimized by integrating renewable energies
- Energy and transportation are of lower significance

Outlook

- LCA-based results provide an essential foundation for environmental accounting frameworks as well as EPDs
- Digital applications (e.g., digital twins) could be used for continuous LCA-based analyses
- Integration of LCA-based energy management analysis

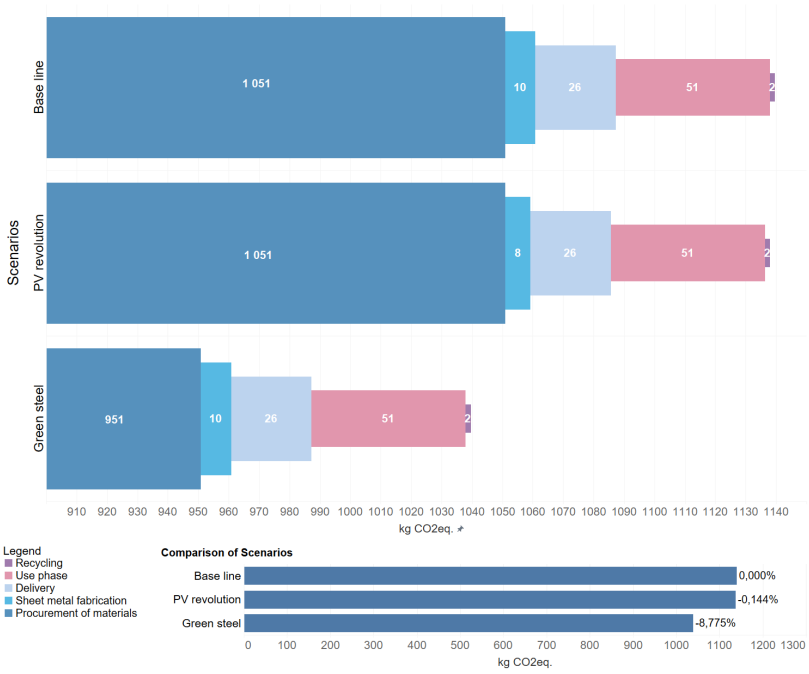


Figure: Comparison of the resulting carbon footprint of the steel-based wear parts under consideration for three different scenarios: (a) base line, (b) PV revolution taking into account 50% locally produced PV electricity, and (c) green steel assuming a base steel with lower carbon content (Illustration: Tableau)

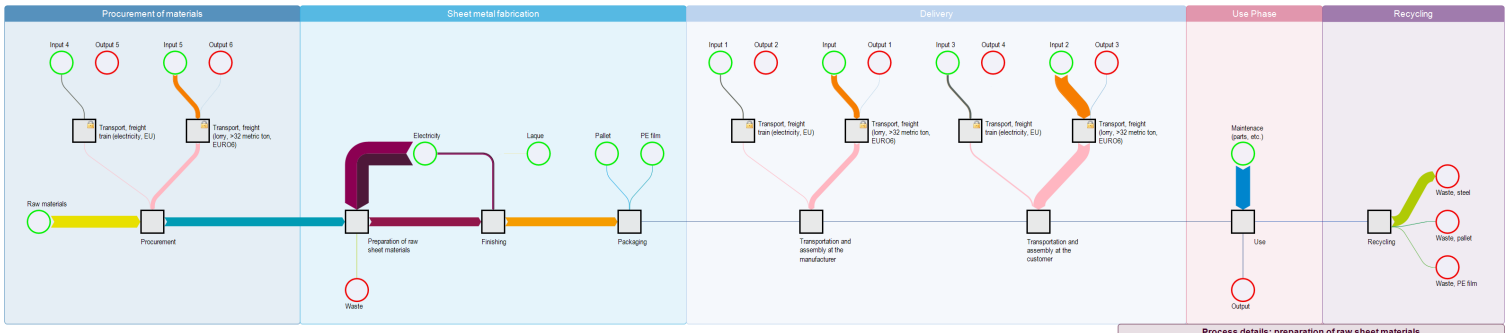
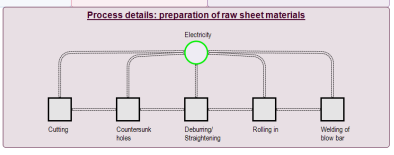
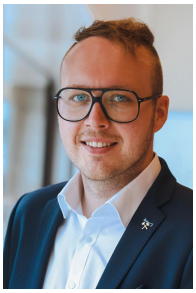


Figure: Resulting flow chart of the final manufacturing process using a simplified „gravel-to-grave“ approach for the steel-based wear parts under consideration (Simulation and illustration: IPoint Umberto)




Dr. Gerald Feichtinger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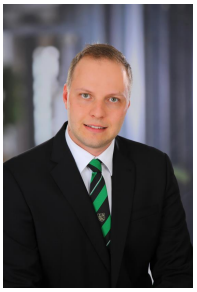
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Research Areas

- Resource Economics
- Energy Management
- Data Analytics