

Streamlining of LCI compilation as the basis of a continuous assessment of environmental aspects in product development

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The continuous assessment of environmental aspects at an early stage of the product development process is a necessary pre-requisite for environmental improvements of products. One of the key barriers to overcome is the considerably high effort connected with the compilation of a life-cycle inventory (LCI) as the basis for a quantitative life-cycle assessment as described by the ISO 14040 series. This is particularly valid for complex technological systems such as passenger cars, which consist of thousands of individual components, each connected to any number of materials and processes.

Volkswagen has developed a semi-automated procedure, which allows the LCA practitioner to compile complete LCIs of passenger cars in a fraction of the time formerly required. As a consequence, the overall efficiency of the LCI compilation was significantly increased.

As an additional benefit, the procedure provides the practitioner with all information needed to compile subsequent LCIs in a way that is fully consistent with prior LCA models. This ensures that differences in environmental aspects between different design options are connected to the respective product modifications rather than due to changes in modelling choices. Together with the gained efficiency, this forms the basis for a continuous, successive environmental assessment of design measures, for which material choices are a prime example.

Keywords: streamlining, life-cycle inventory (LCI), life-cycle assessment (LCA)

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Streamlining of LCI compilation

**as the basis of a continuous assessment of
environmental aspects in product development**

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Agenda

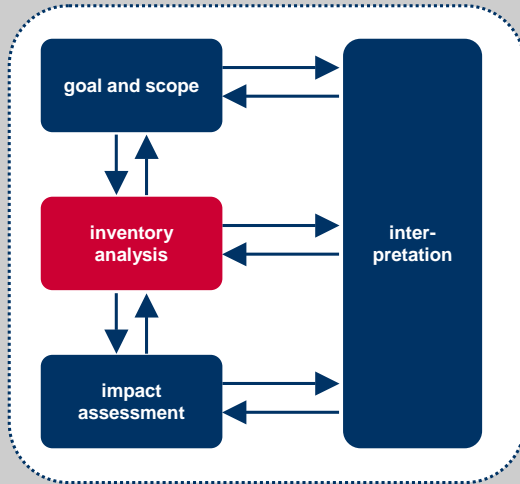
- 1. Initial situation and problem description**
- 2. Streamlining the LCI compilation**
- 3. Challenges**
- 4. Conclusion**

slide 1

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Life-Cycle Assessment according to ISO 14040



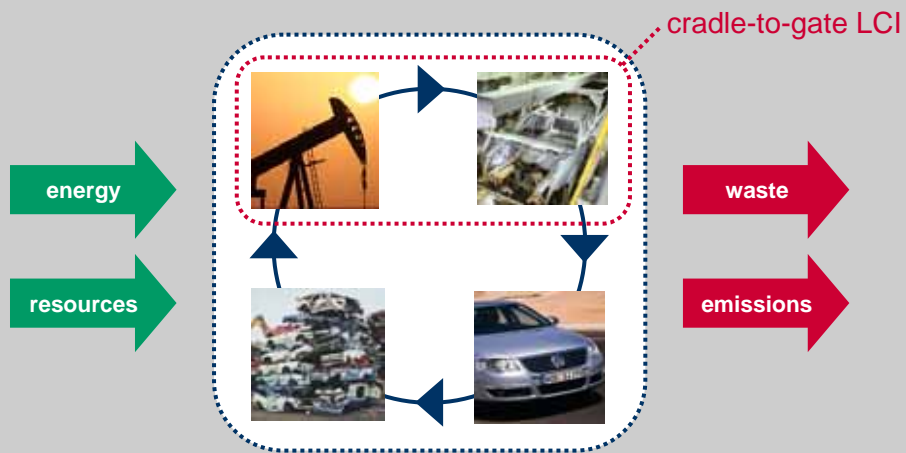
Prerequisites for improvement:

- continuous assessment
- at early stage of development

LCA most time consuming step of conducting an LCA study of complex technical systems.

slide 2

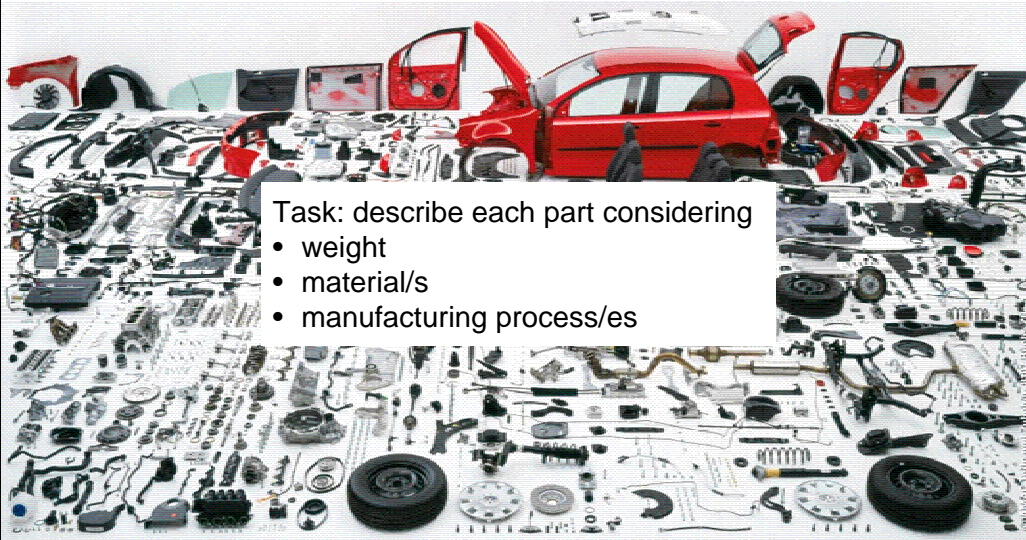
Key barrier: effort connected to LCI compilation



> 6000 individual parts, each consisting of any number of materials

slide 3

Key barrier: effort connected to LCI compilation

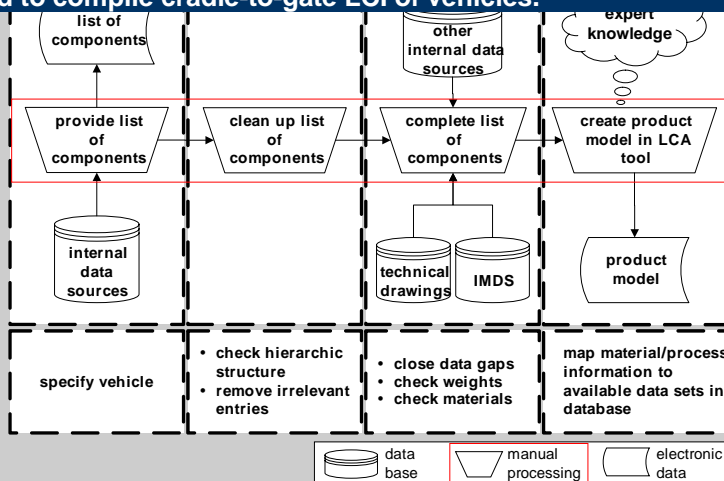


Task: describe each part considering

- weight
- material/s
- manufacturing process/es

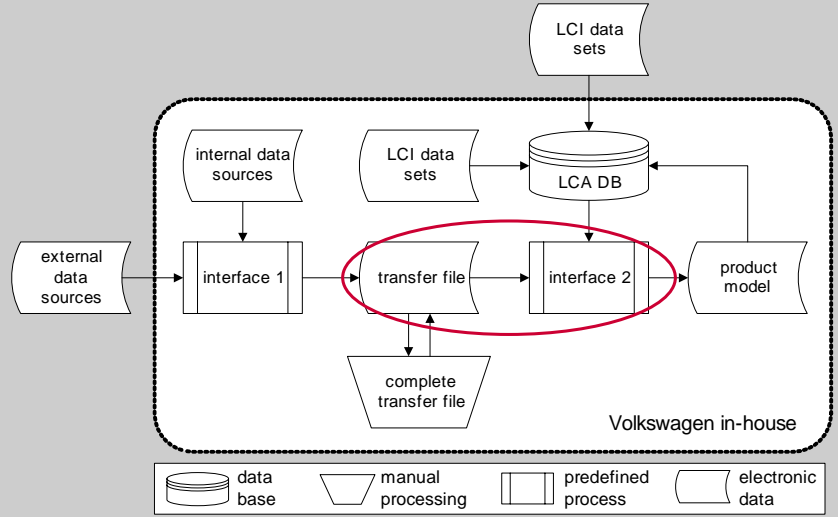
Previous procedure of LCI compilation

Main challenge: reduce amount of time, manpower and expert knowledge required to compile cradle-to-gate LCI of vehicles.



slide 5

Solution: automation of process steps



slide 6

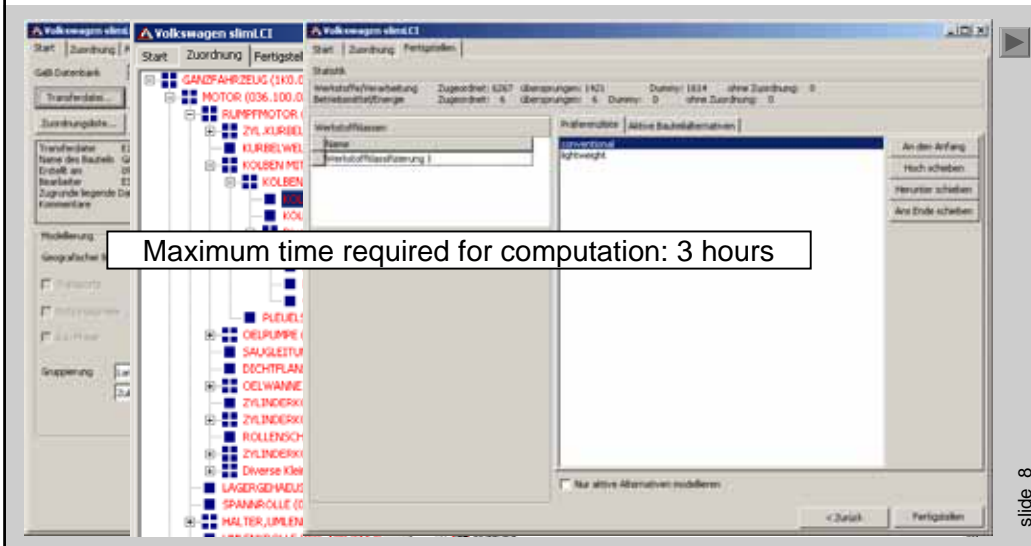
The transfer file

File containing basic information such as

- hierarchic structure,
 - part number,
 - weight of component,
 - number of component,
 - material composition of component,
 - manufacturing process/es,
- and further optional elements, e.g.
- alternative components.

slide 7

Interface 2 – creating the product model



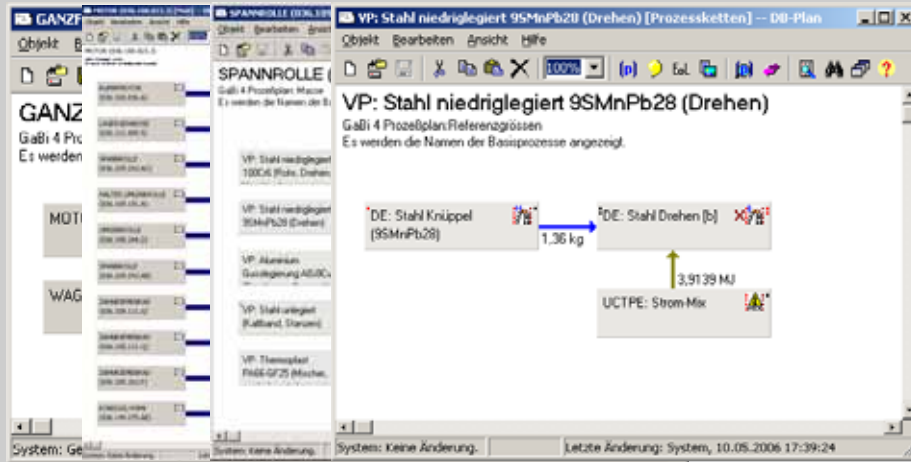
slide 8

example of a specific mapping task

	material denotation	manufacturing process 1	manufacturing process 2	manufacturing process 3
process element	non-alloy steel	cold rolling	hot-dip galvanizing	die cutting
mapping options	assign OR skip OR dummy	assign OR skip OR dummy	assign OR skip OR dummy	assign OR skip OR dummy

slide 9

Model structure in LCA tool (GaBi 4.2)

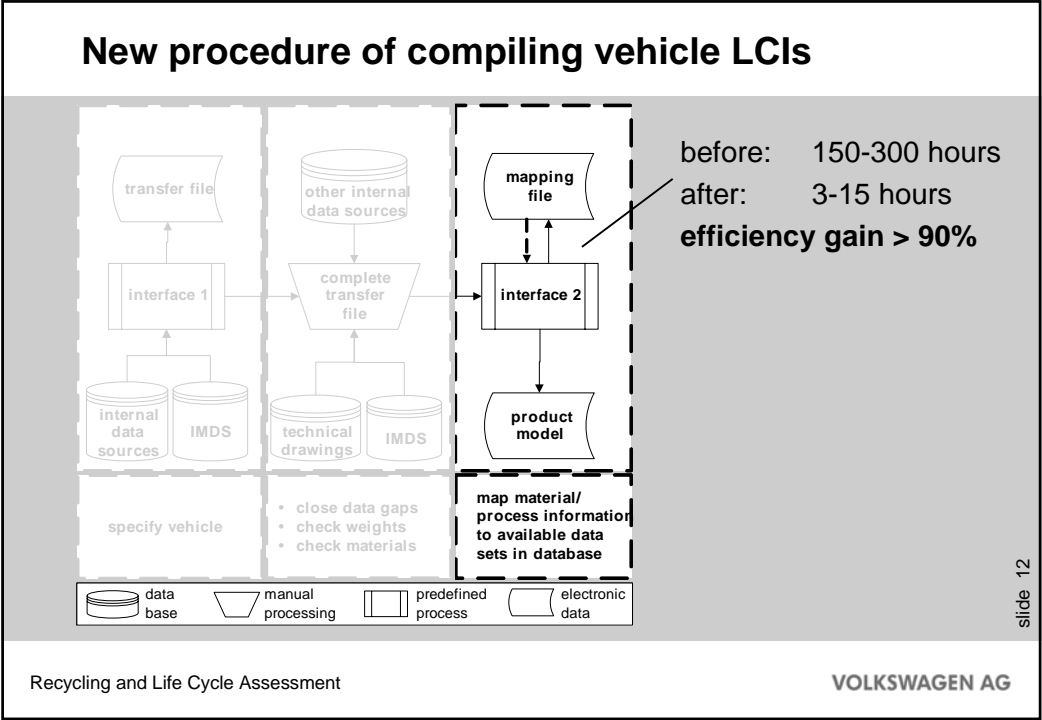


slide 10

Challenge: availability of LCI data sets

- The automotive industry is highly innovative in terms of materials and processes.
- It is not always feasible to provide LCI data for all materials and processes (e.g. for confidentiality reasons).
- The use of surrogate data remains an important strategy.
- Accept or neglect data gaps? → Relevance to the outcome?
 - **Provision of peer-reviewed data on new materials and/or processes remains a necessary prerequisite.**
 - **The presented procedure supports an iterative learning process through the consistent and efficient integration of new data.**
 - **For comparison with established materials, estimates on improvement potentials of innovative materials is necessary.**

slide 11



Conclusion

The presented procedure generates significant benefits in terms of

- time / workload (automation)
- consistency (identical mappings)
- transparency and reproducibility (comprehensive documentation)

compared to the previous manner of LCI compilation.

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slide 13

Thank you very much for your attention.

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