MateriNex launch event

Strategic and critical raw materials

The Digital Enterprise for Sustainability: model-based and lifecycle-spanning engineering

Siemens Industry Software NV, Leuven, Belgium

Flanders Make, Leuven, Belgium

KU Leuven, Leuven, Belgium

18 June 2024

Siemens DEGREE framework

A 360° view on Siemens priorities in our business and our own operations

Sustainability business

D – Decarbonization

Support the 1.5° C target to fight global warming

E – Ethics

Foster culture of trust, adhere to ethical standards and handle data with care

G – Governance

Apply state-of-the-art systems for effective and responsible business conduct

R – Resource efficiency

Achieve circularity and dematerialization

E – Equity

Foster diversity, inclusion, and community development to create a sense of belonging

E – Employability

Enable our people to stay resilient and relevant in a permanently changing environment

Sustainability in own operations

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Customer expectations on LCA tools are increasing with fast growing governmental regulations

Trends

Pressure for increased transparency

Increased scrutiny of environmental claims and concerns of greenwashing

Stakeholder pressure to report the environmental impacts of products and services

Customers

Challenges

LCA integration in product eco-design

Interpret results and make quicker decisions on the environmental trade-offs between alternatives

Increase flexibility to perform varying levels of LCA analysis depending on the business need

Enhance data accessibility and quality for conducting reliable LCAs

LCA usage

is shifting left within the Customer's process assisting them in design and manufacturing to make the right decisions to balance environmental requirements with cost, performance and time-to-market

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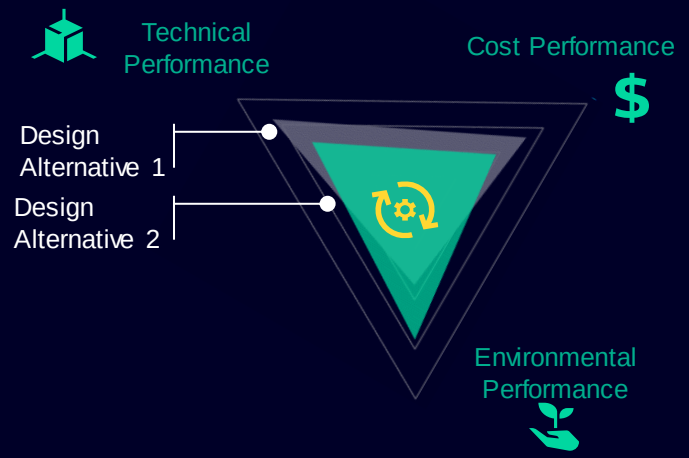
Customer expectations on LCA tools are increasing with fast growing governmental regulations

PREDICTIVE

LCA data needed to select materials, manufacturing processes, execute technical analyses /simulations, optimize designs … at different stages of product maturity iterations.

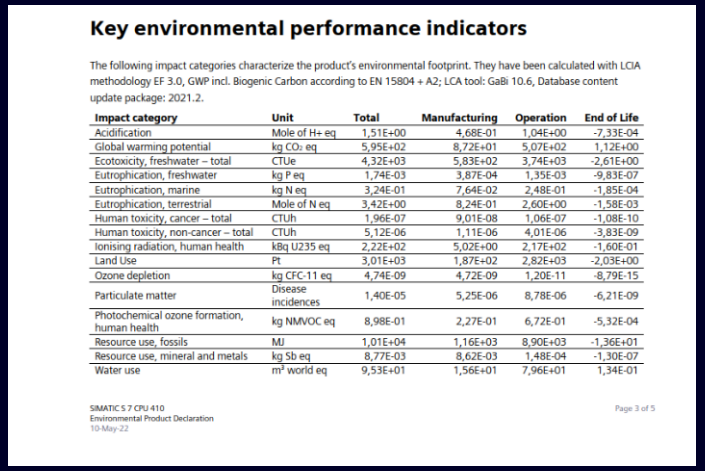


For **Decision Making**

FULL

LCA data required to generate a final LCA analysis needed for reporting purposes (e.g. EPDs). Done on a released Bill of materiel (BOM).

EPD



Key environmental performance indicators

The following impact categories characterize the product's environmental footprint. They have been calculated with LCIA methodology EF 3.0, GWP incl. Biogenic Carbon according to EN 15804 + A2; LCA tool: GaBi 10.6, Database content update package: 2021.2.

Impact category	Unit	Total	Manufacturing	Operation	End of Life
Acidification	Mole of H+ eq	1,51E+00	4,68E-01	1,04E+00	-7,33E-04
Global warming potential	kg CO_2 eq	5,95E+02	8,72E+01	5,07E+02	1,12E+00
Ecotoxicity, freshwater – total	CTUe	4,32E+03	5,83E+02	3,74E+03	-2,61E+00
Eutrophication, freshwater	kg P eq	1,74E-03	3,87E-04	1,35E-03	-9,83E-07
Eutrophication, marine	kg N eq	3,24E-01	7,64E-02	2,48E-01	-1,85E-04
Eutrophication, terrestrial	Mole of N eq	3,42E+00	8,24E-01	2,60E+00	-1,58E-03
Human toxicity, cancer – total	CTUh	1,96E-07	9,01E-08	1,06E-07	-1,08E-10
Human toxicity, non-cancer – total	CTUh	5,12E-06	1,11E-06	4,01E-06	-3,83E-09
Ionising radiation, human health	kBq U235 eq	2,22E+02	5,02E+00	2,17E+02	-1,60E-01
Land Use	Pt	3,01E+03	1,87E+02	2,82E+03	-2,03E+00
Ozone depletion	kg CFC-11 eq	4,74E-09	4,72E-09	1,20E-11	-8,79E-15
Particulate matter	Disease incidences	1,40E-05	5,25E-06	8,78E-06	-6,21E-09
Photochemical ozone formation, human health	kg NMVOC eq	8,98E-01	2,27E-01	6,72E-01	-5,32E-04
Resource use, fossils	MJ	1,01E+04	1,16E+03	8,90E+03	-1,36E+01
Resource use, mineral and metals	kg Sb eq	8,77E-03	8,62E-03	1,48E-04	-1,30E-07
Water use	m^3 world eq	9,53E+01	1,56E+01	7,96E+01	1,34E-01

SIMATIC S 7 CPU 410
Environmental Product Declaration
10-May-22

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For **Reporting**

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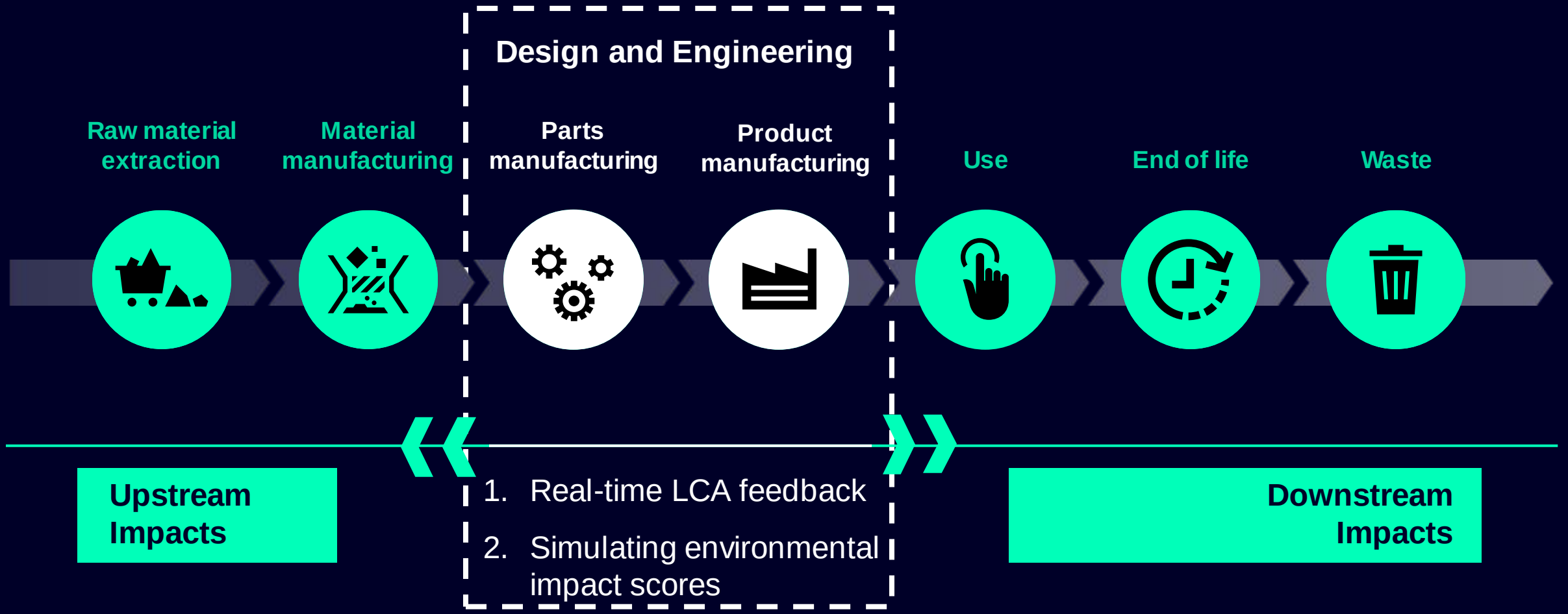
We need real-time feedback on the over-the-lifecycle environmental impact of engineering decisions



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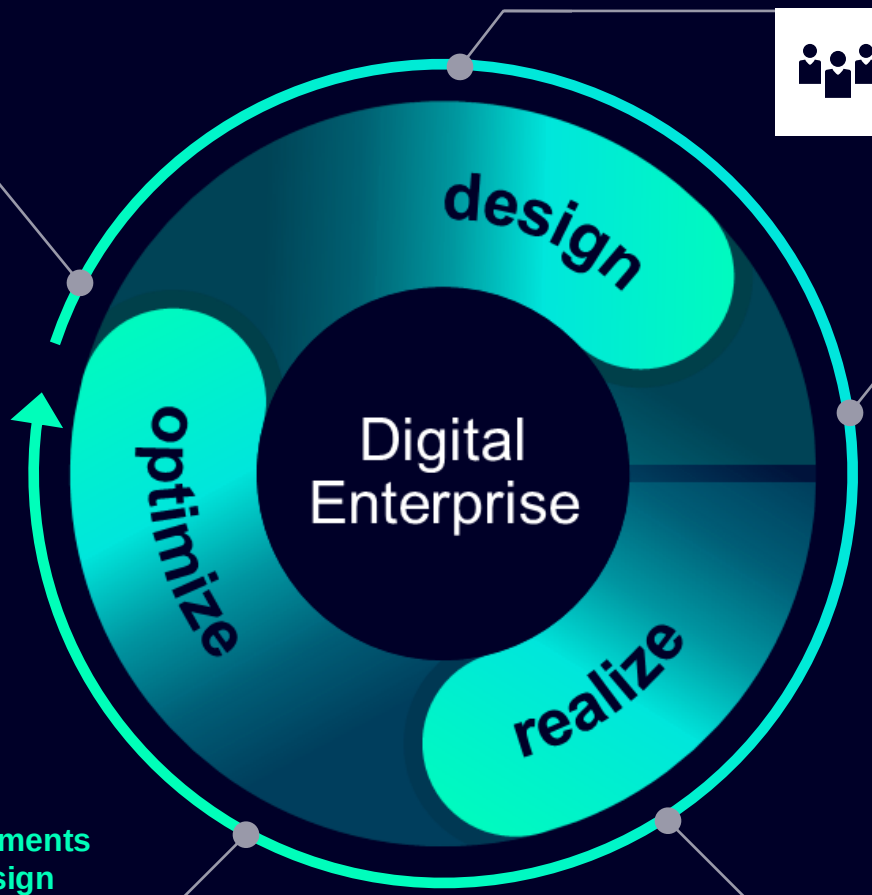
Effective Optimization for Sustainability requires a holistic approach

Enabled by the Digital Enterprise



Select sustainable suppliers

Conceptual design

Detailed design

Validate and monitor operational KPIs and update models

Identify improvements & implement design changes

- Sustainable concept that is connected to sustainability requirements
- Drive sustainability requirements and compliance within the supply chain
- More sustainable designs and fast innovation with fewer prototypes
- Ensure product performance aligns with sustainability targets
- Seamlessly bring sustainability improvements into new and existing products

Establishing system thinking and applying model-based and lifecycle-spanning engineering

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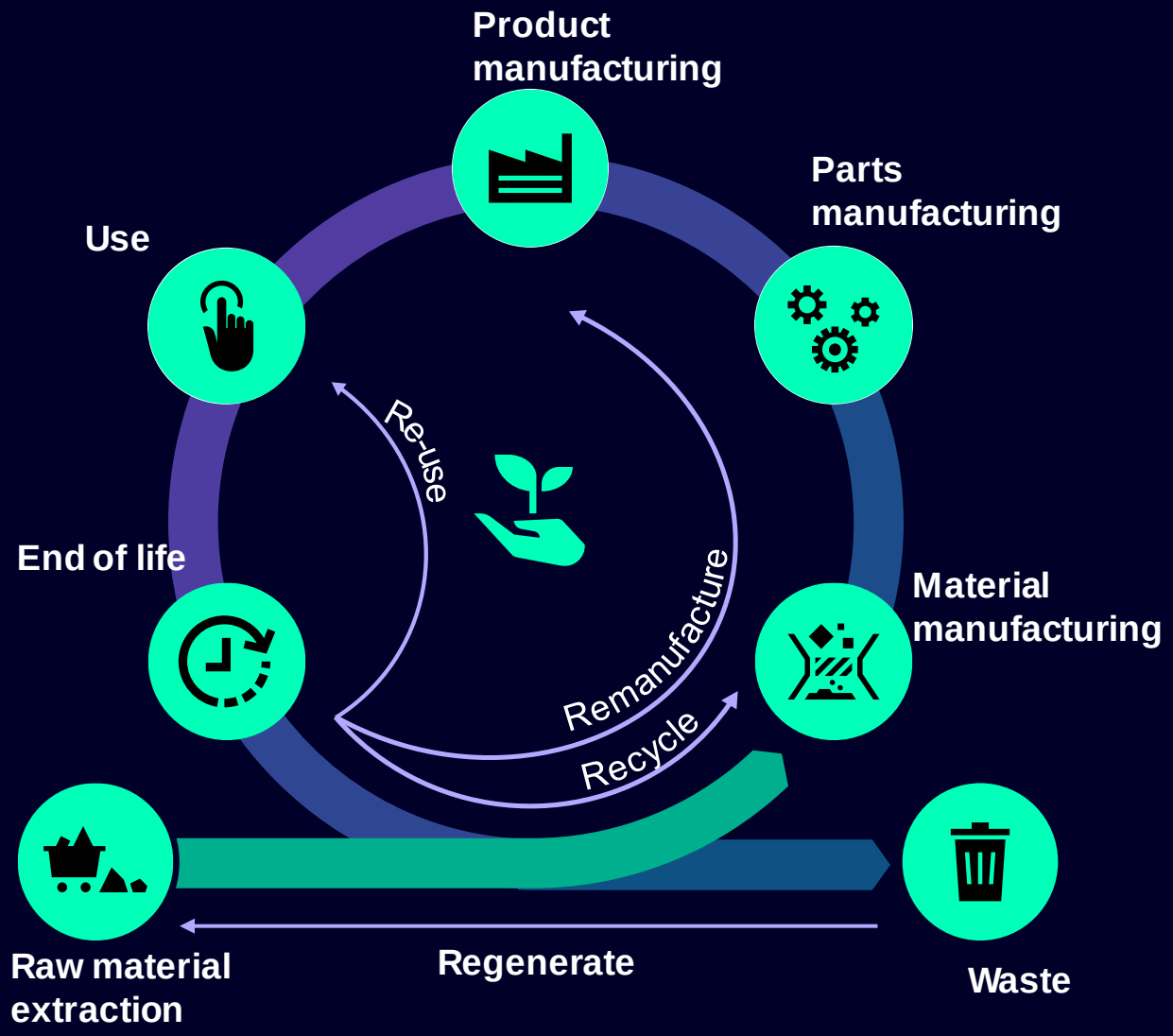
Circularity – rethinking product design to reduce full life cycle impacts



Collaboration along the full value chain is needed!

Building up Belgian consortium along the full value chain to apply for research project

Potential industrial partners:

DANA TENNECO

Tier 1 suppliers

OEM
Material Suppliers
End Users
Recycling company
…

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