Smarter, Optimized, Product Decisions with Ansys

*An example for **Sustainable Product Design***

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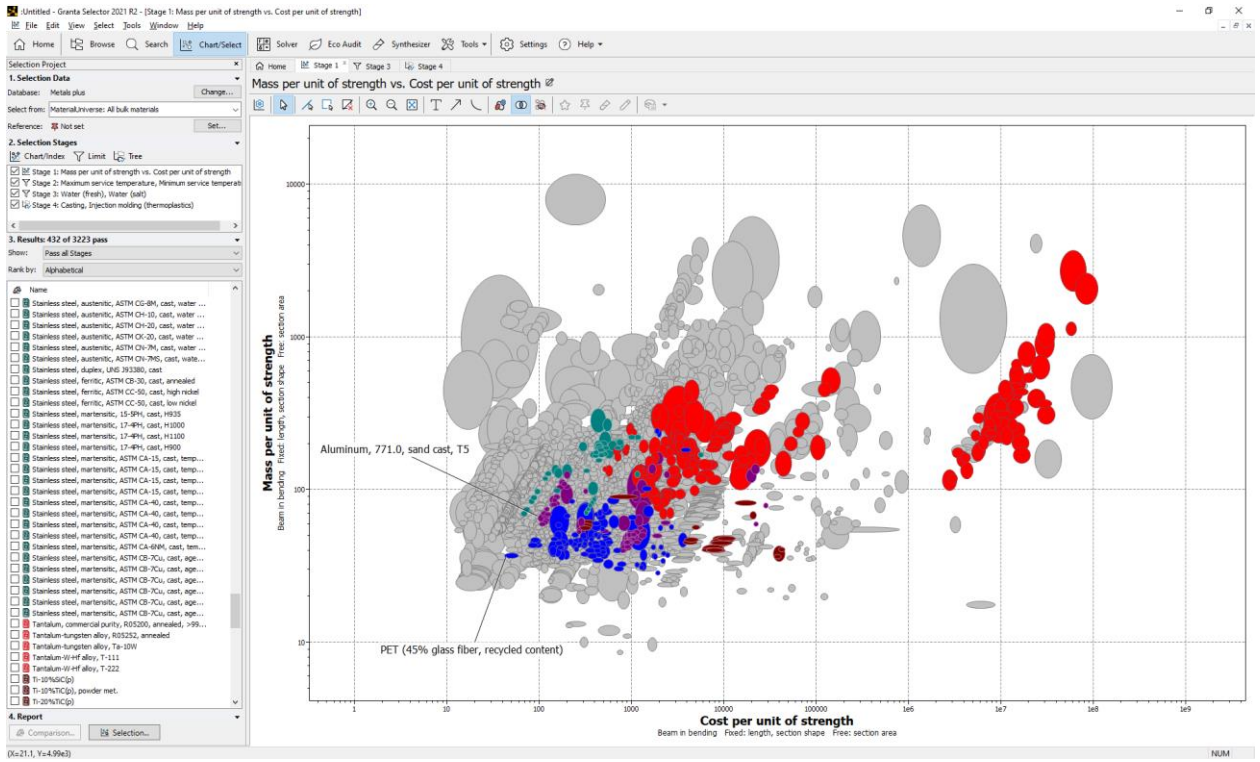
How do you optimize a product?

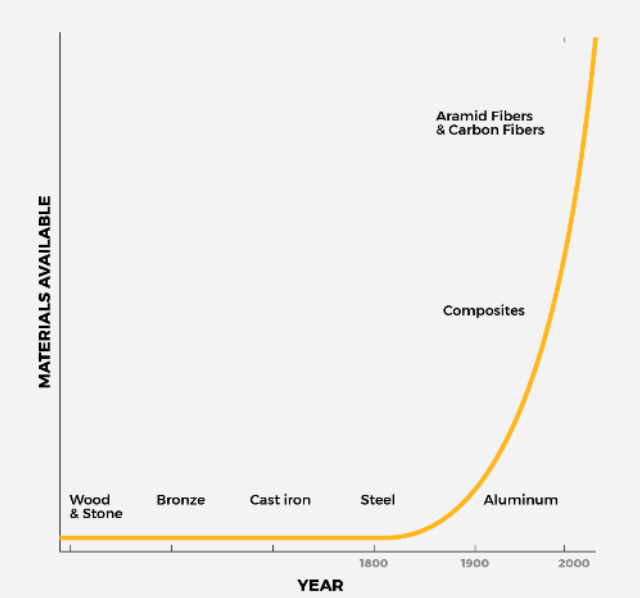


- **Optimize Design**
  - Geometry
  - Loads
  - Boundary conditions
  - Thermal, electrical, etc
- **Optimize Materials**
  - Technical performance
  - Economic

Environmental impact

Optimal Material + Optimal Design = Optimal Product

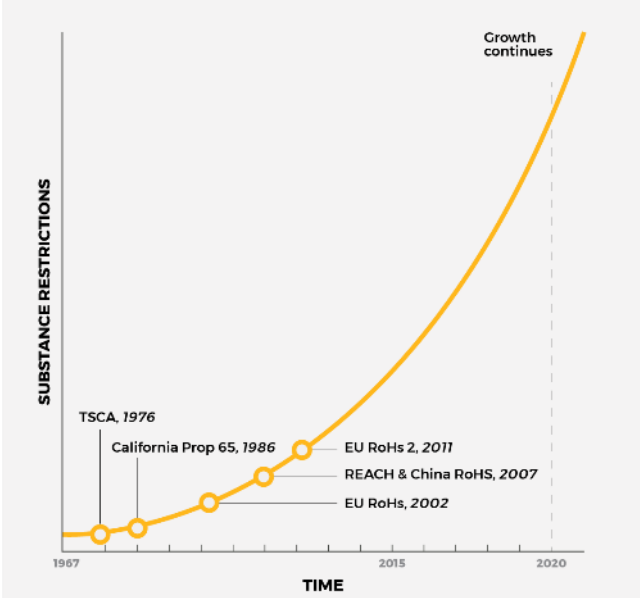
Materials information ‘triple challenge’ for sustainability



Material choices are increasing dramatically

Materials information is complex

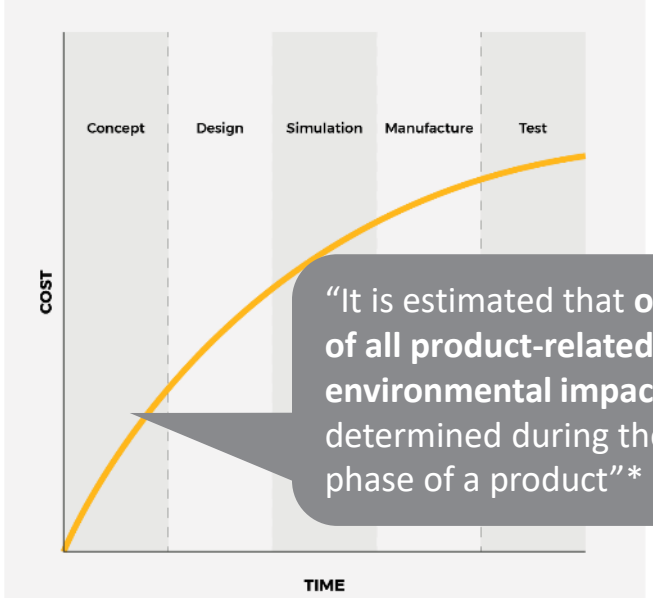
Difficult to acquire information from supply chain



Continuous increase in restricted substances

Legislation changes on a regular basis

Requirements differ by geography



“It is estimated that **over 80% of all product-related environmental impacts** are determined during the design phase of a product”*

It is essential to choose the right materials from the start

Product life cycles can be long

The problem is distributed across multiple teams

*https://ec.europa.eu/jrc/en/research-topic/sustainable-product-policy

What are the main objectives in the product design process?

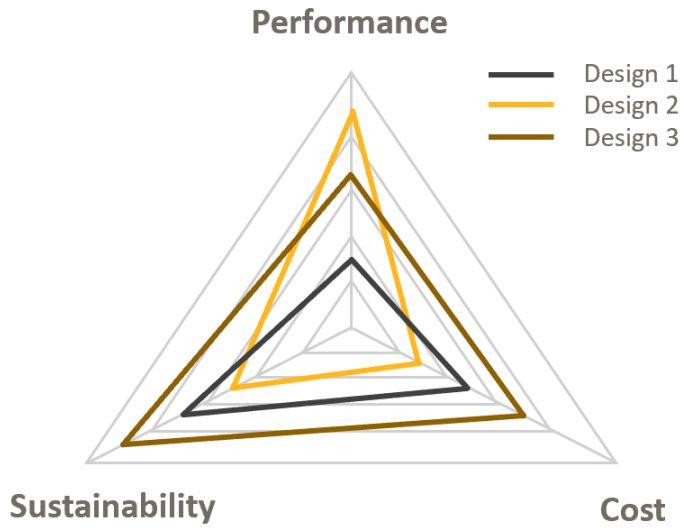
Today

- Today the main focus in product design is based on a compromise between **performance** and **cost**
- What if you could extend this in the **triangle** of technical **performance / cost / sustainability** for your products on an **enterprise level** ?

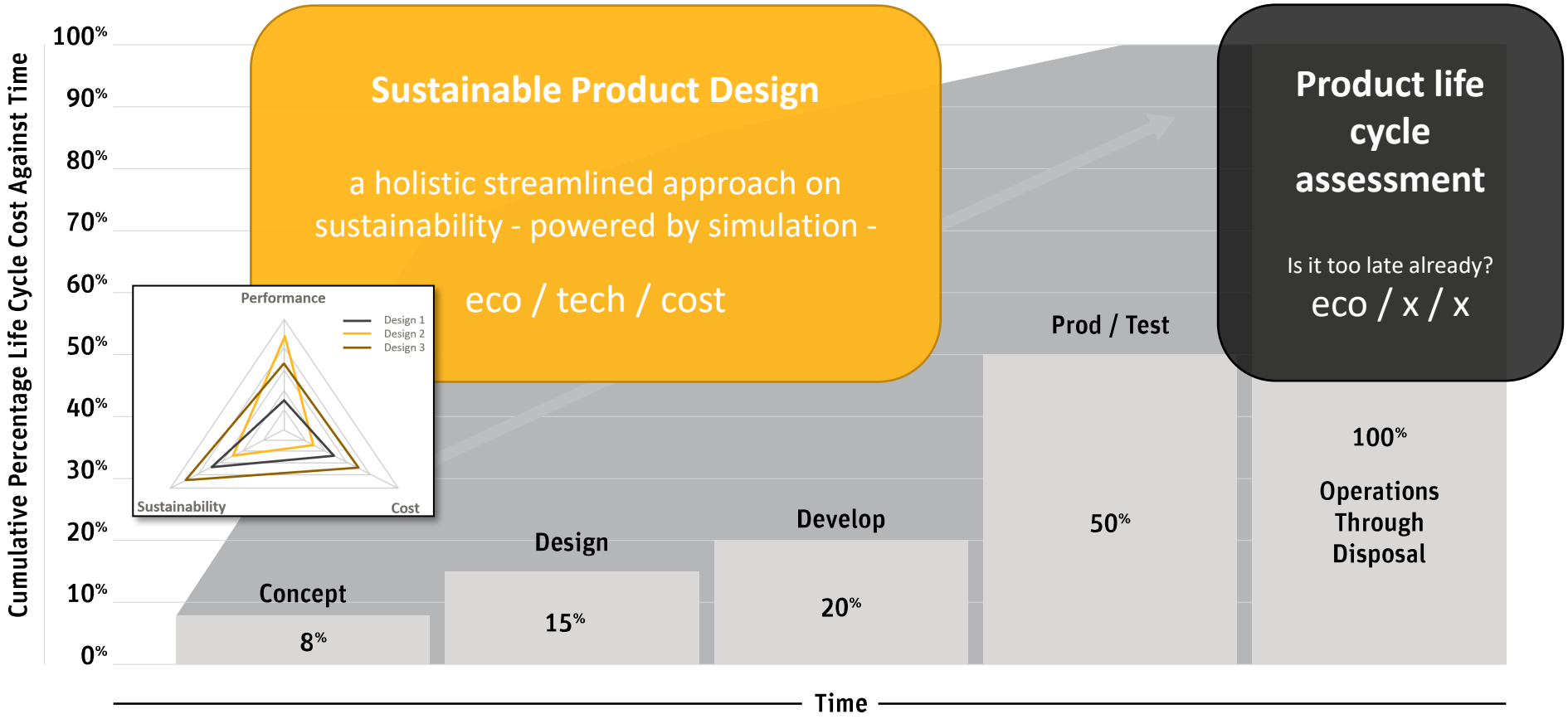
Performance **Costs**

Future vision

- Enable understanding of customer designs at all levels:
  - What impact do different materials choices have?
  - What impact does changing my geometry have?
  - How is multi-physics performance impacted?
  - What happens if I use a different supplier?
  - How do these factors interacts with each other?



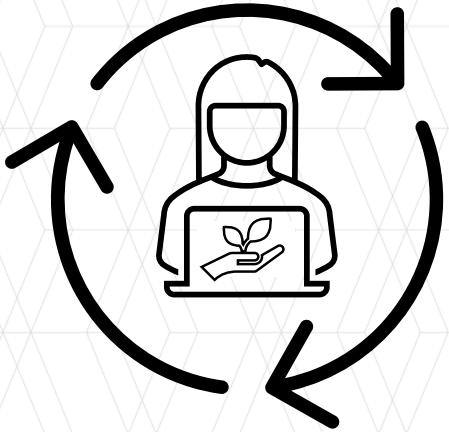
Smart, distinct decisions early in the development cycle



SHIFT LEFT MORE INNOVATION | FASTER CYCLE TIMES | REDUCED COSTS AND RISKS

80% OF DEVELOPMENT COSTS ARE LOCKED IN EARLY IN THE CONCEPT AND DESIGN PHASES

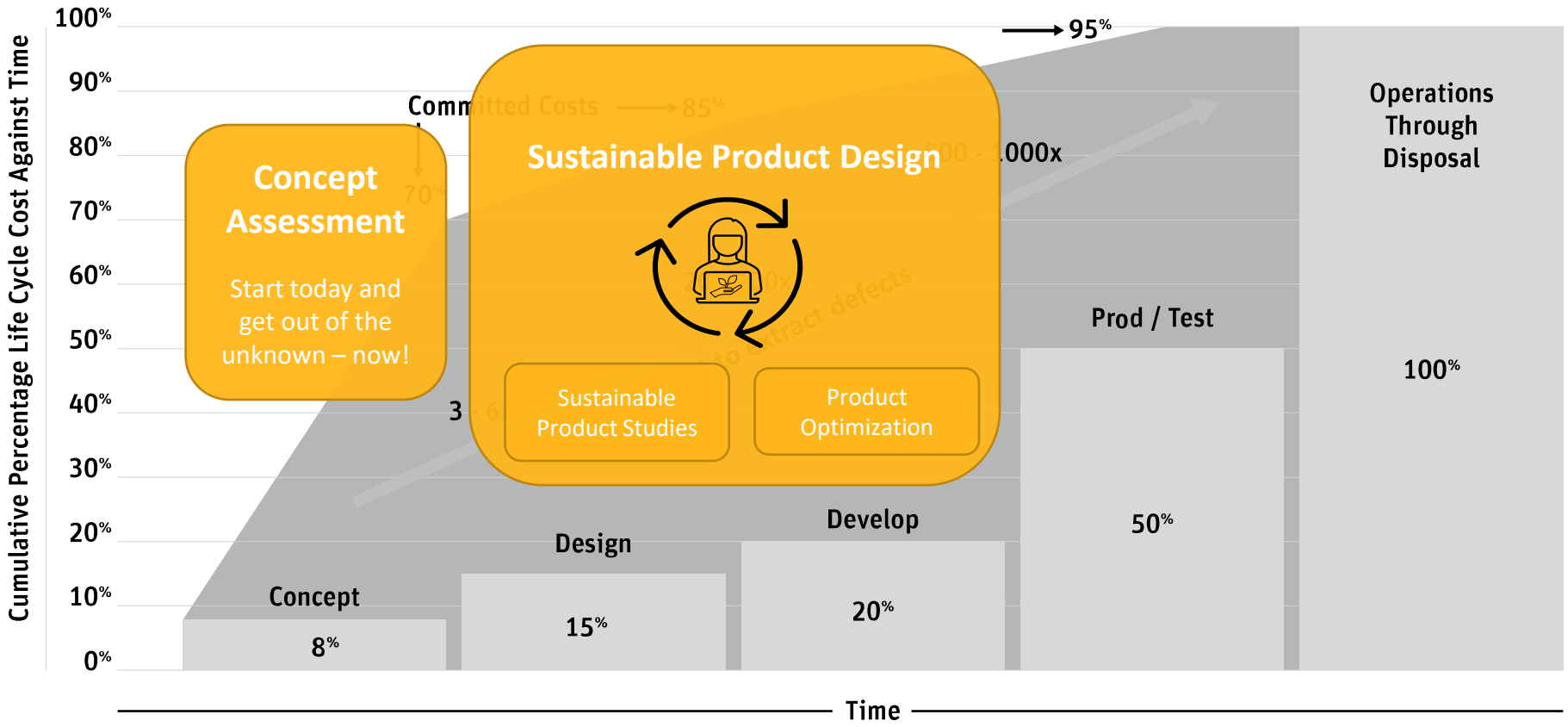
Step approach



How to get started with Ansys now and what could an enterprise approach on Sustainable Product Design look like

Ansys

Smart, distinct decisions early in the development cycle

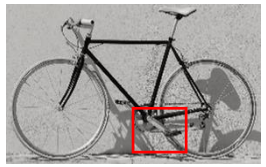


→ Ansys approach on sustainable product design

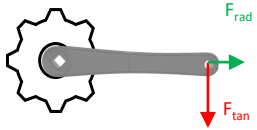
Use case: **Concept Assessment** – Bike Crank Case Study

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

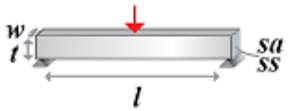
Case study: bike crank



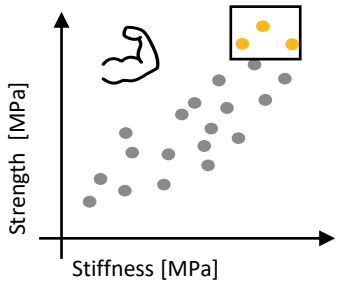
Component: crank arm

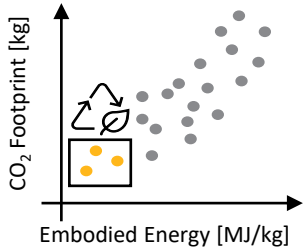


Function

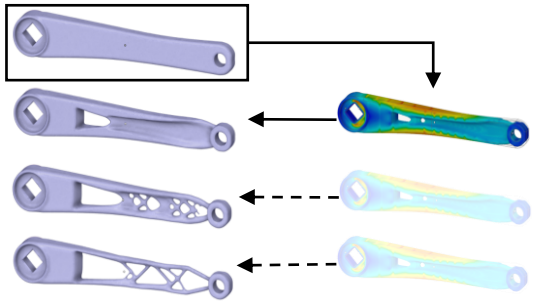


Material Selection

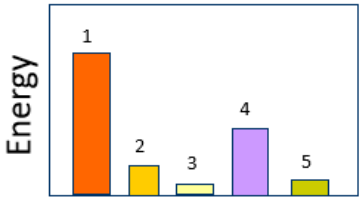




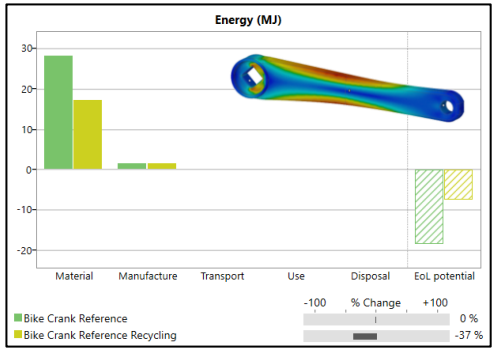
Validation & Design Optimization



Concept Assessment



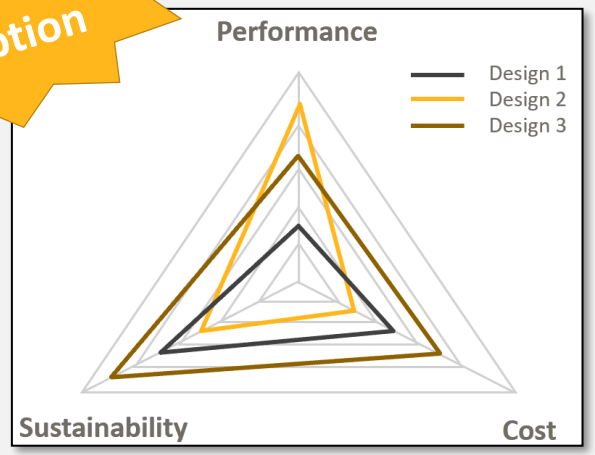
Optimal Design



Use Case: **Sustainable Product Design -** parameterised design for:

Technical Performance – Cost – Sustainability

Initial adoption



Optimization and Visualization

- Visualisation of parameter impact
- Enables design understanding
- Optimize for sustainability, performance, cost or any combination of these

input parameters and responses

Tool Chaining

- Chain solvers and data sources
- Associate parameters and responses to a single design
- Remove failed designs

Data Source

- Simulation-ready materials data
- Materials data for sustainability

Material data:
- *Costs*
- *Sustainability*

Parameterised Design(s)

Parameters:
- Geometry
- Materials choice
- Meshing
- …

Responses:
- Performance indicators
- Sustainability indicators
- Cost

Simulation params.

Performance results

Simulation Engine

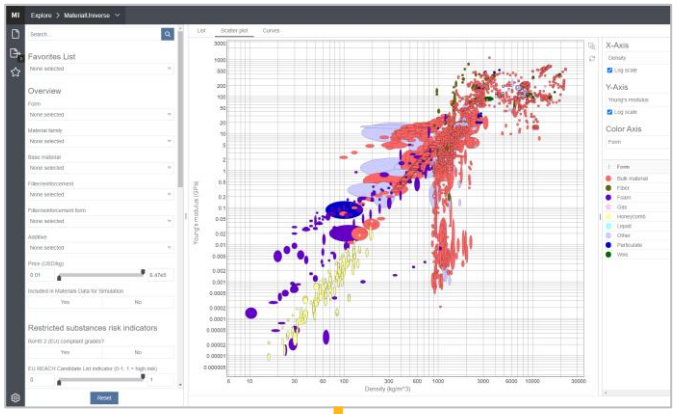
- Parameterised simulation model
- Receives values for geometry, mesh, materials etc. from optiSLang
- Returns performance indicators as results of simulation

Simulation-ready data

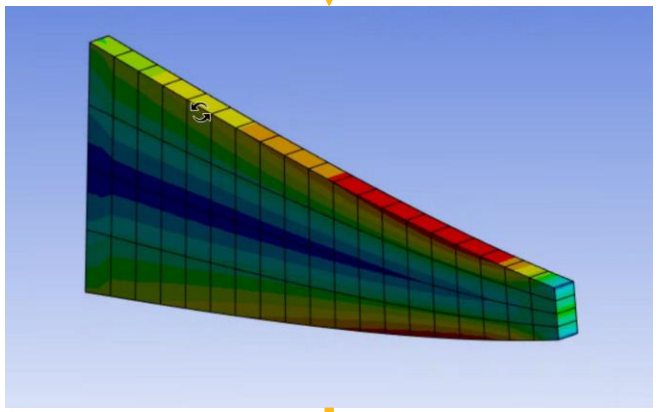
Sustainable Product Design – Parametrised Design

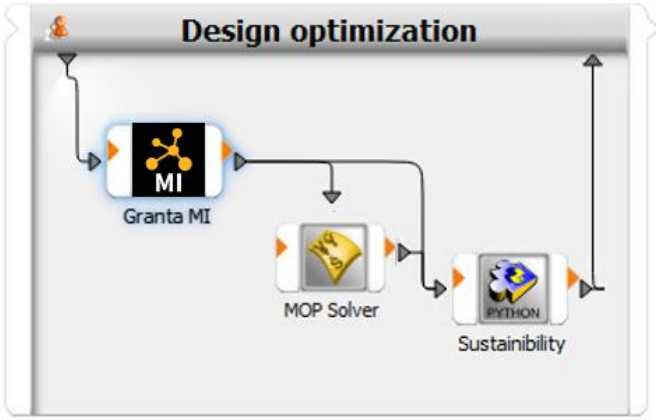
Input | **Set up** | **Output**

Material Selection

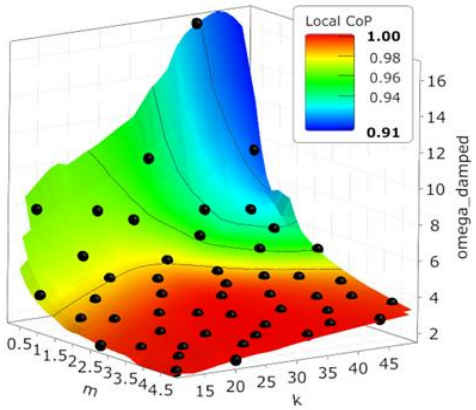


Define Analysis

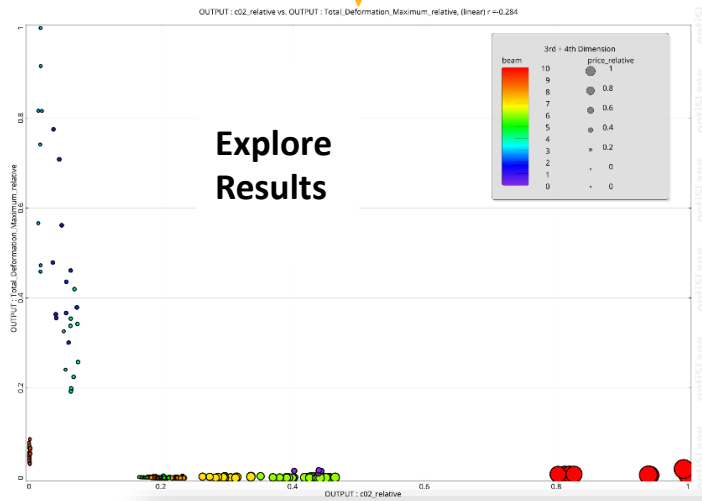




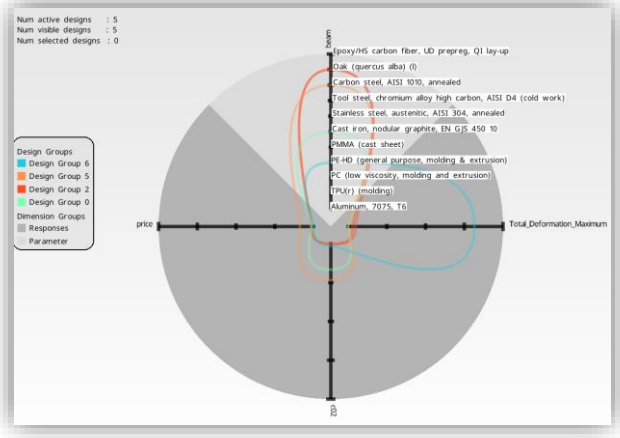
Build Meta-model



Explore Results

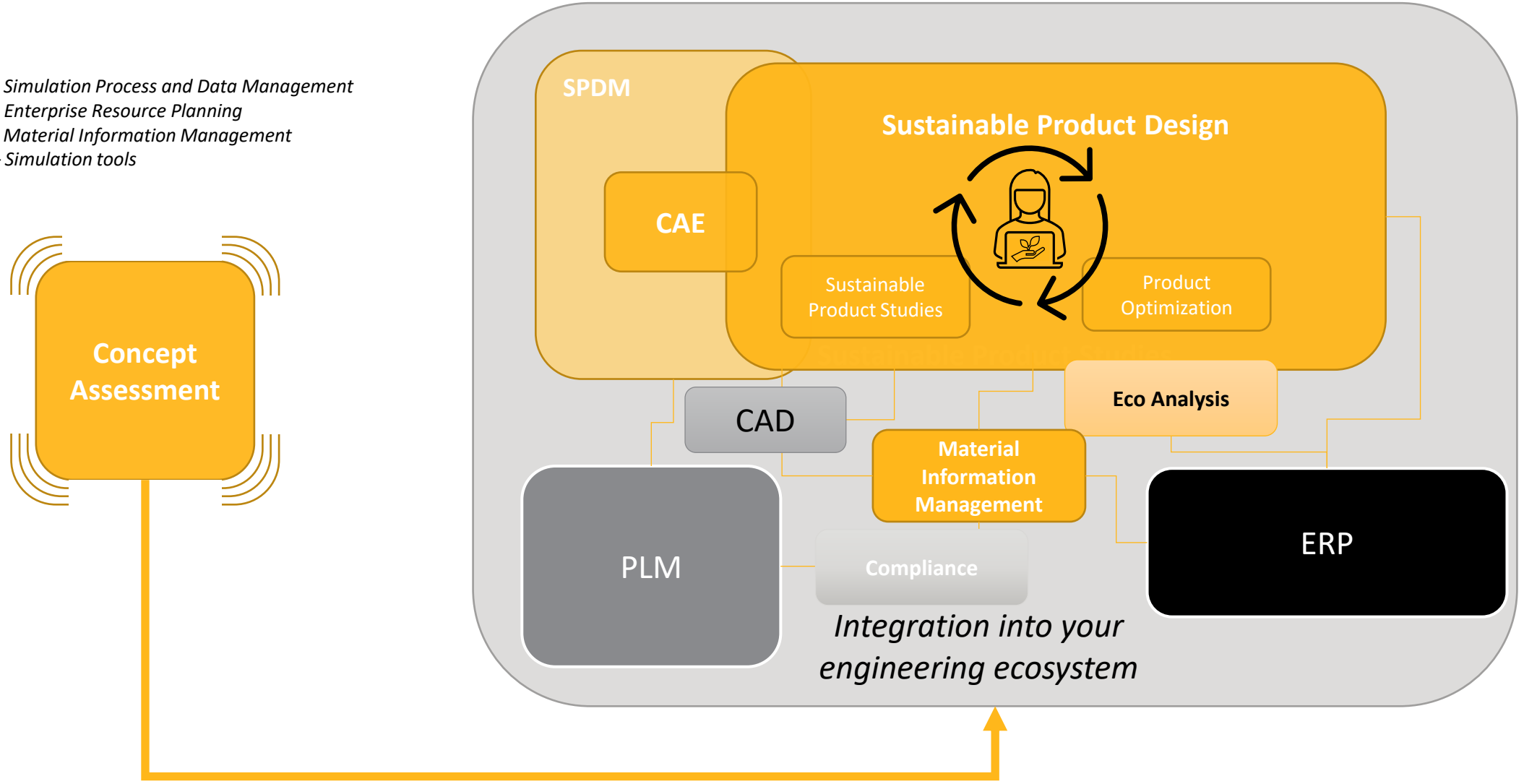


Highlight Findings



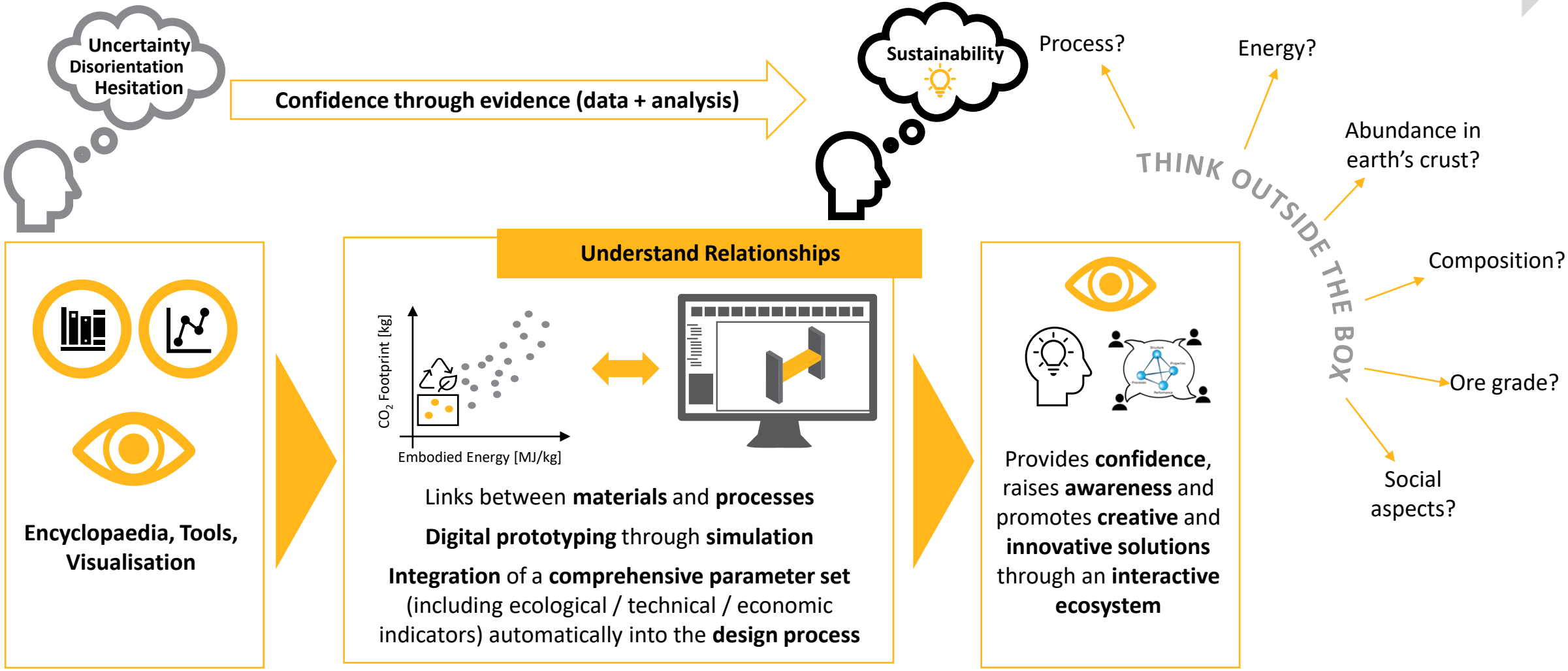
How does this fit in your engineering ecosystem?

Legend:
SPDM – Simulation Process and Data Management
ERP – Enterprise Resource Planning
MIM – Material Information Management
CAE – Simulation tools



Summary / Conclusion

Sustainability as Integral Part of the Engineering Processes

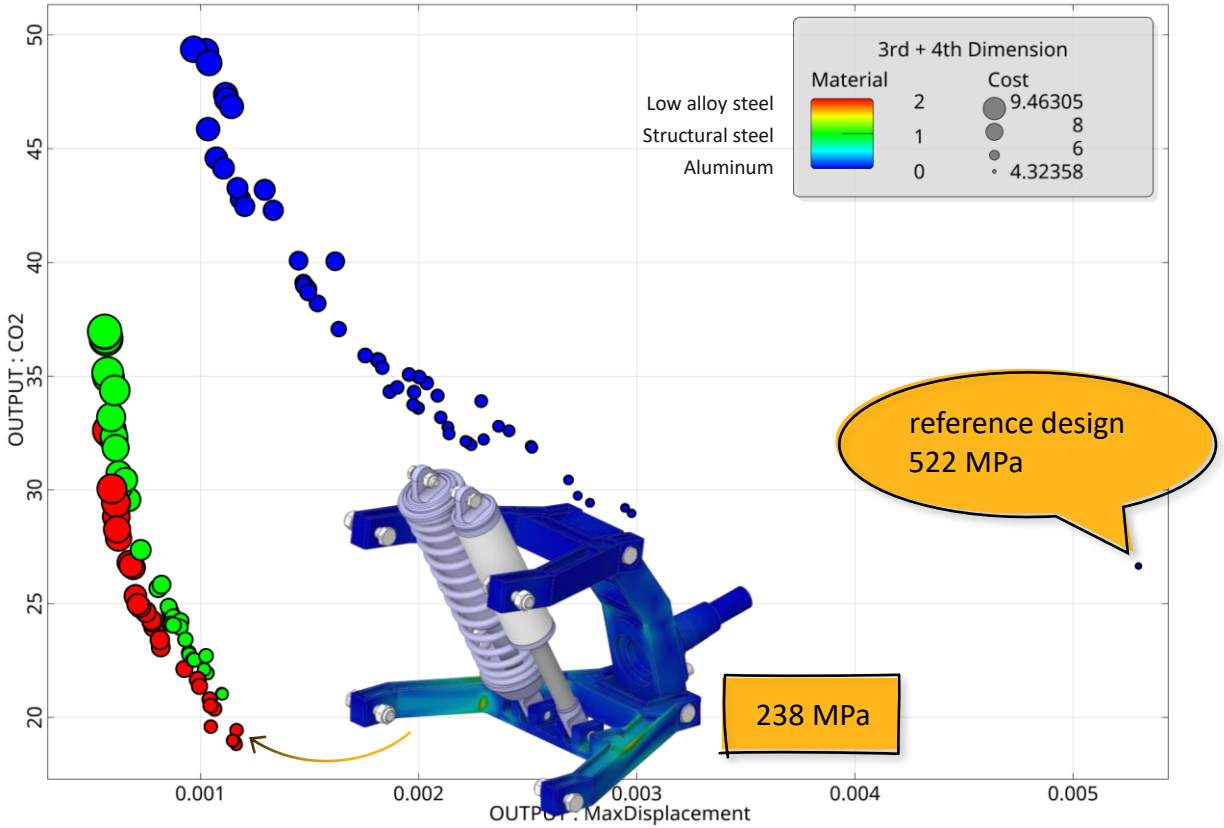


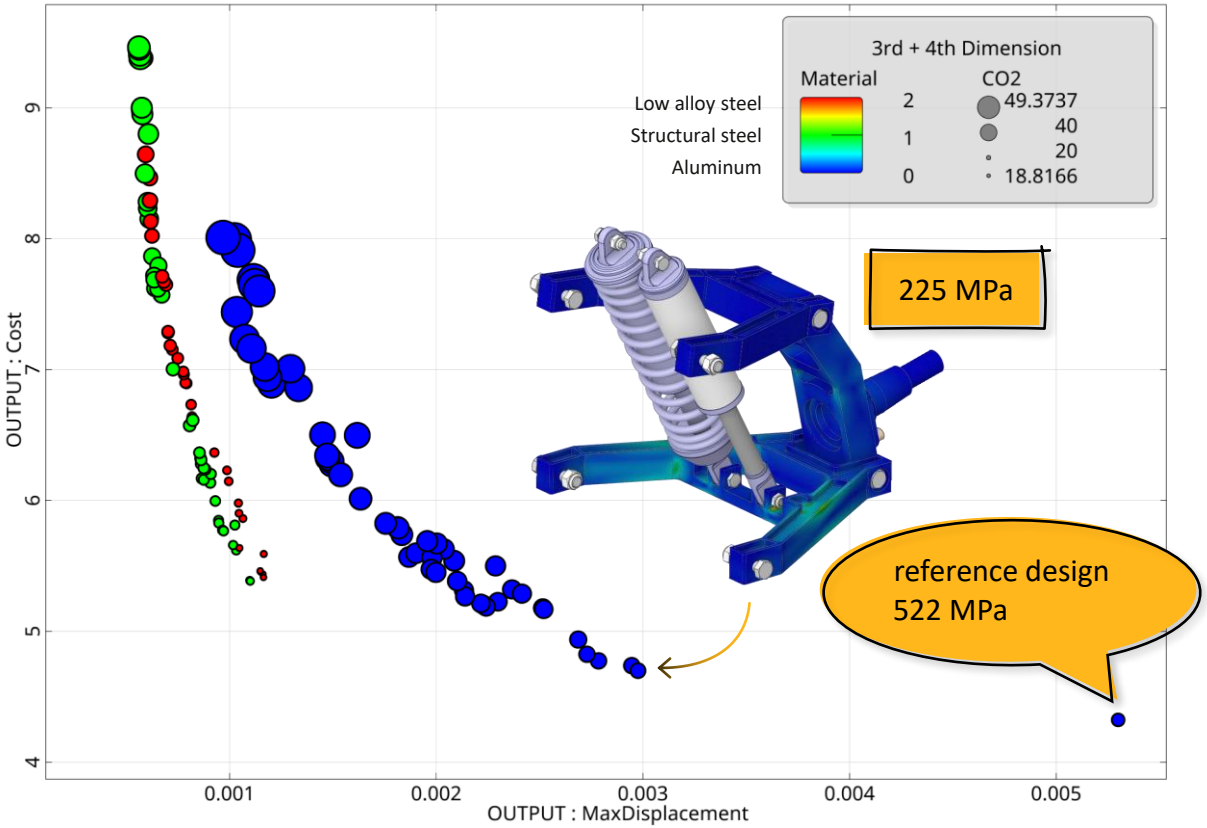
Race Truck Suspension in Structural Optimization

Ansys

Results [Pareto fronts]

All designs meet a safety factor of 1.2, other designs are automatically filtered out.





When optimizing the CO2 footprint and maximum displacement, the reference material, aluminum, is not the best choice.

In terms of cost reduction, aluminum is worth considering because for almost the same cost we see a design with almost half the reference displacement.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