

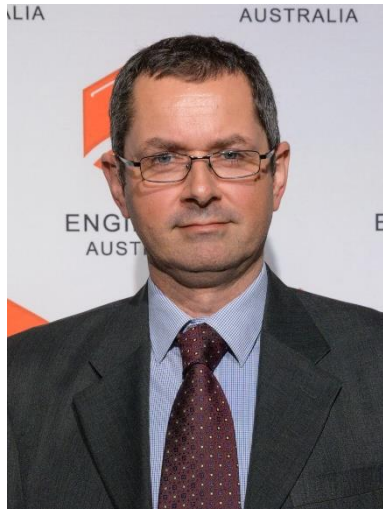


STRUCTURE OF AN INTEGRATED CAD/CAE SYSTEM FOR DESIGN AND ELECTRONIC PROTOTYPING OF PRODUCTS IN THE FOUNDRY INDUSTRY



CONFERENCE
May 2022

For those who don't know me



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Managing Director
PLM Hive Pty. Ltd.



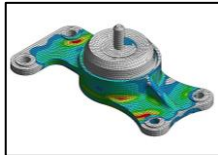
IPILEX PIPELINES



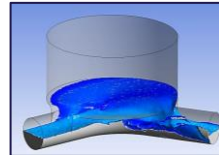
PLM Hive company overview



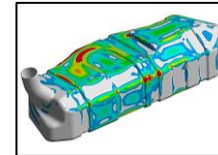
- Product Lifecycle Management
- Product Development
- Forensic Engineering



Automotive



Infrastructure



Rotational Moulding



Railway



Foundry



Aviation

Structure of the presentation

Product Lifecycle Management

Product Development

Product Design (CAD)

Product Engineering (CAE)

Topology Optimization

Generative Design

Failure Investigation

What is Product Lifecycle Management

Product Lifecycle Management (PLM) is the process of managing the entire lifecycle of a product from its conception, through design and manufacture, to service, and disposal. PLM integrates people, data, processes, and business systems and provides a product information backbone for companies and their extended enterprise. **[Kurkin, Ondrej, Januska, Marlin: Product lifecycle in digital factory, IBIMA, 2010]**

Product Lifecycle Management is the process of managing complex product information, engineering workflows, manufacturing and distribution workflows, and collaboration across various business functions. PLM connects people, data and processes across the entire product lifecycle to a central information repository. **[Saaksvuori, Immonen: PLM, Springer, 2005]**

Product Lifecycle Management comprises of the procedures required to design and develop the product, produce it on the shop floor and decommission it at the end of its life. **[PLM Technology Guide, Internet Archive]**

Product Lifecycle Management is an integrated, information-driven strategy that speeds the innovation and launch of successful products. **[CIO Wiki]**

Where is PLM coming from

PLM emerged in 1980s in automotive industry.

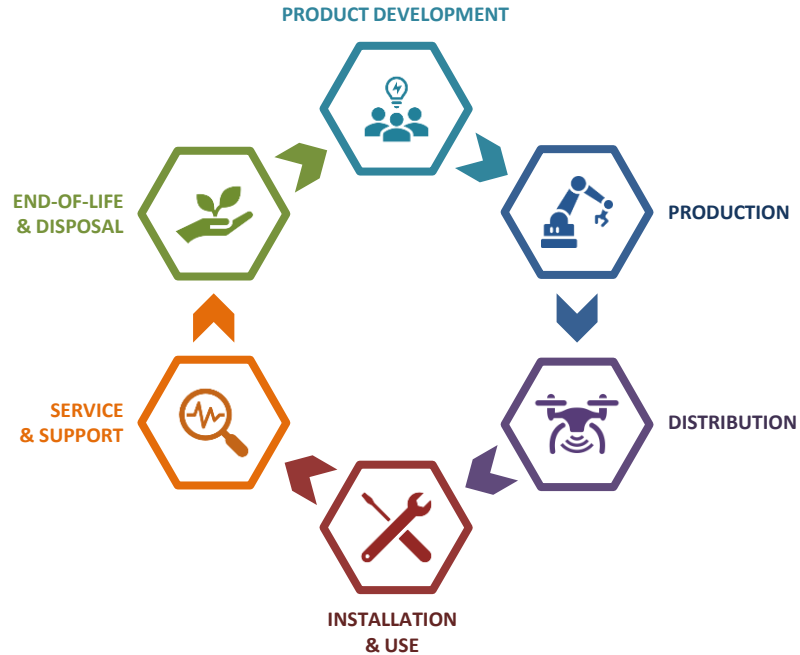


When Chrysler bought American Motors in 1987, they decided to keep the PLM framework because it had been so effective.



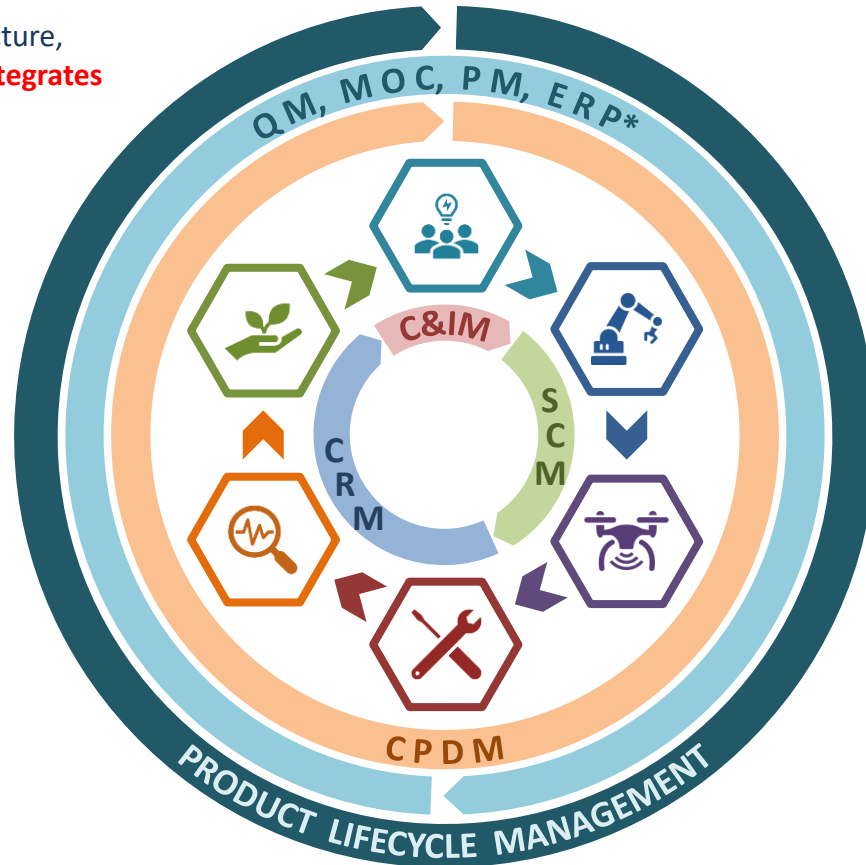
Product Lifecycle Management

... from its conception,
through design and manufacture,
to service, and disposal ... integrates
people, data, processes, and
business systems ...



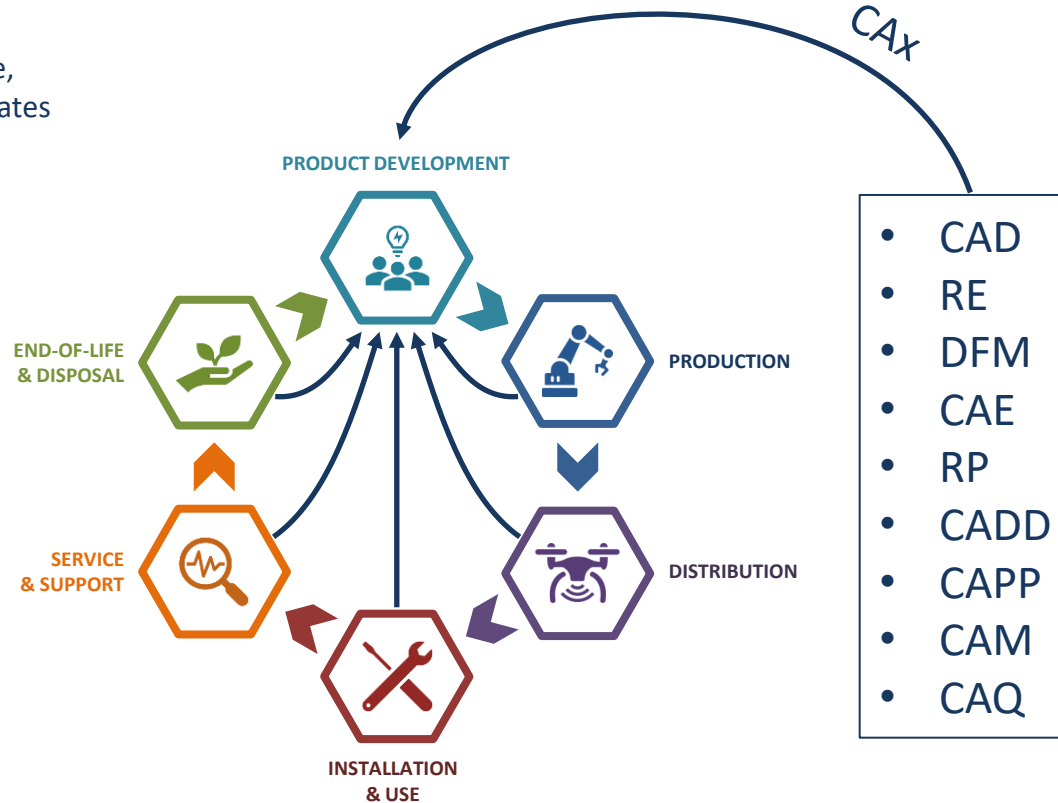
Product Lifecycle Management

... from its conception,
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Product Lifecycle Management

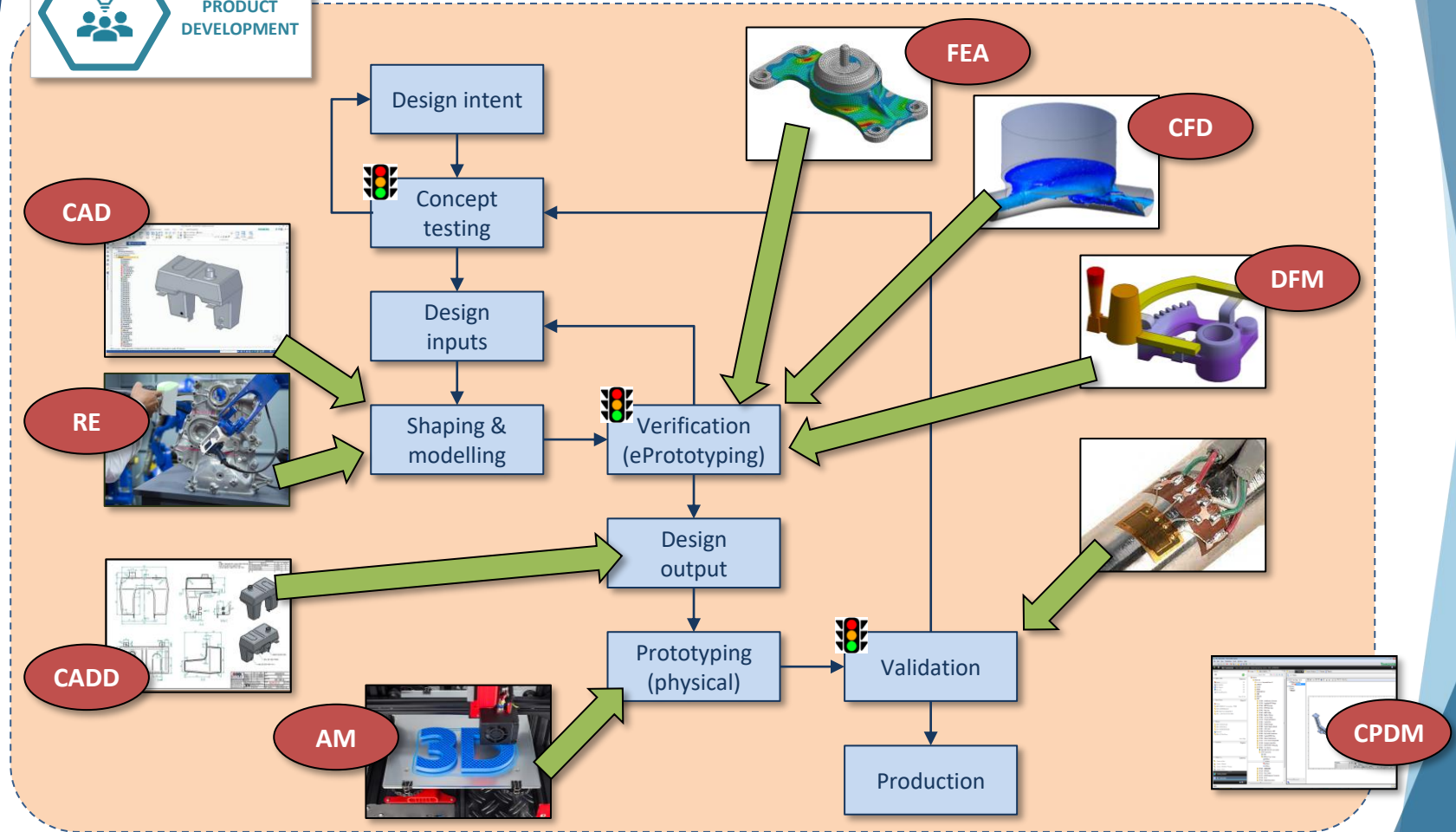
... from its conception, through design and manufacture, to service, and disposal ... integrates people, data, processes, and business systems ...





PRODUCT
DEVELOPMENT

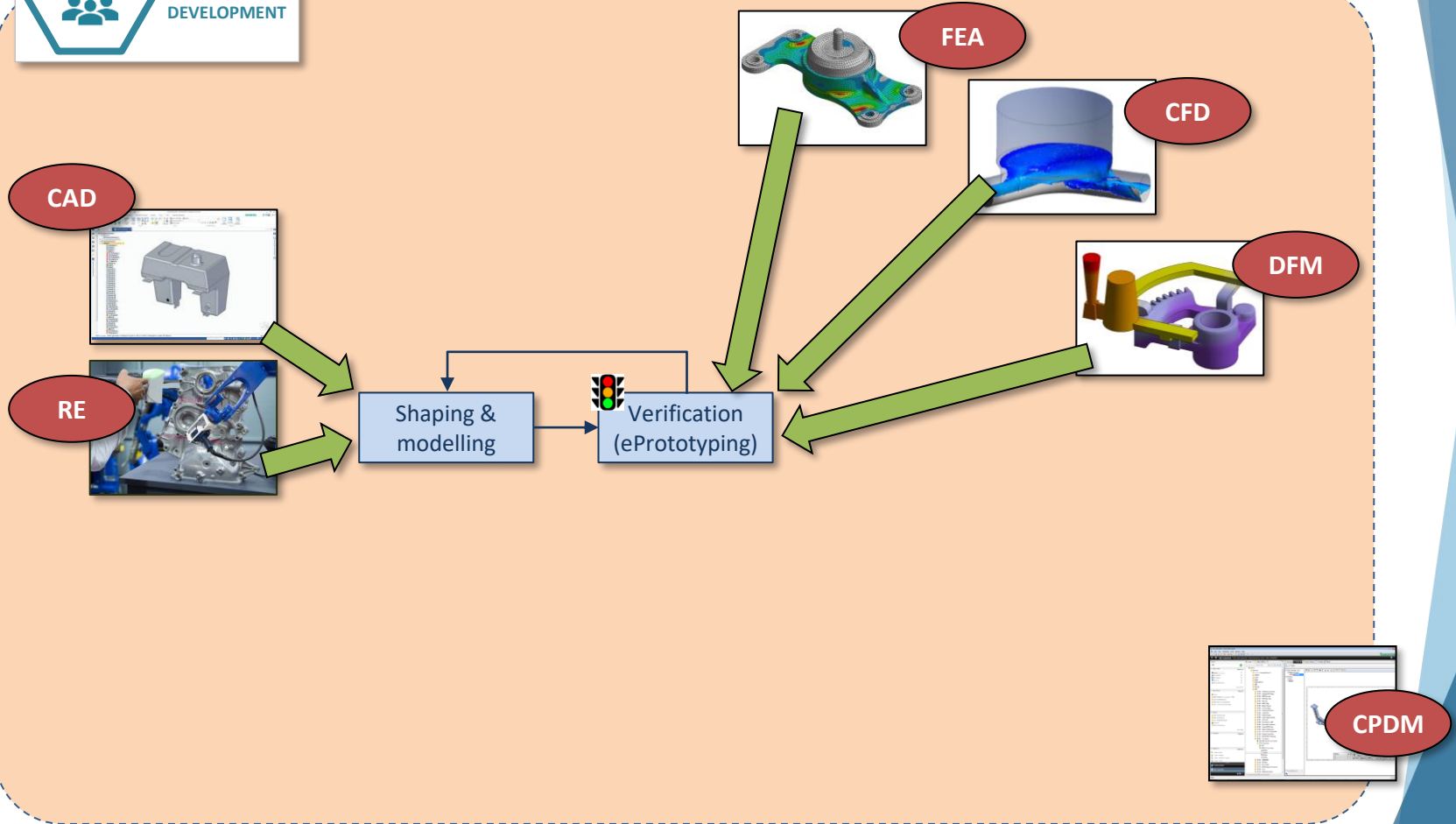
The Workflow



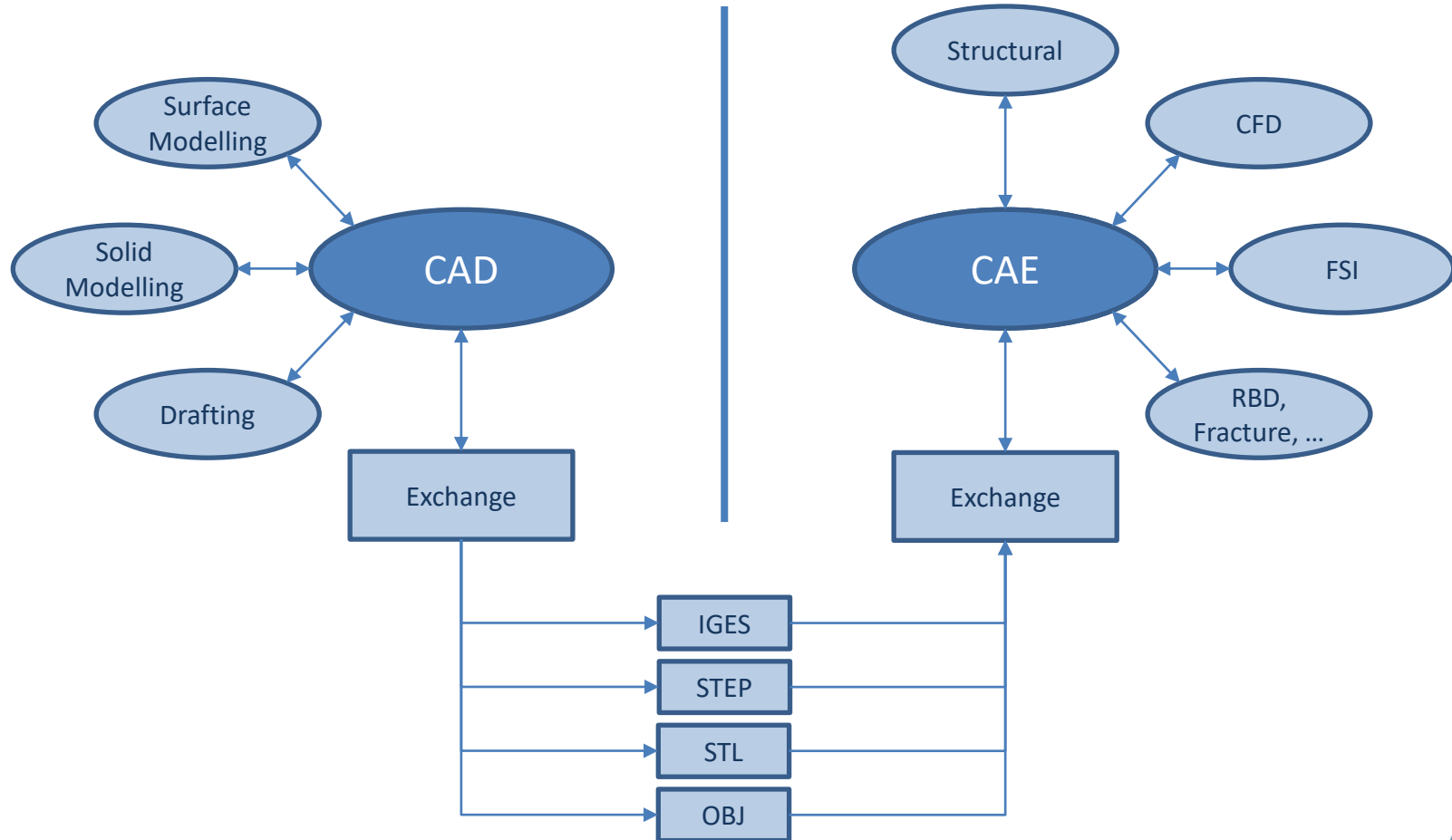


PRODUCT
DEVELOPMENT

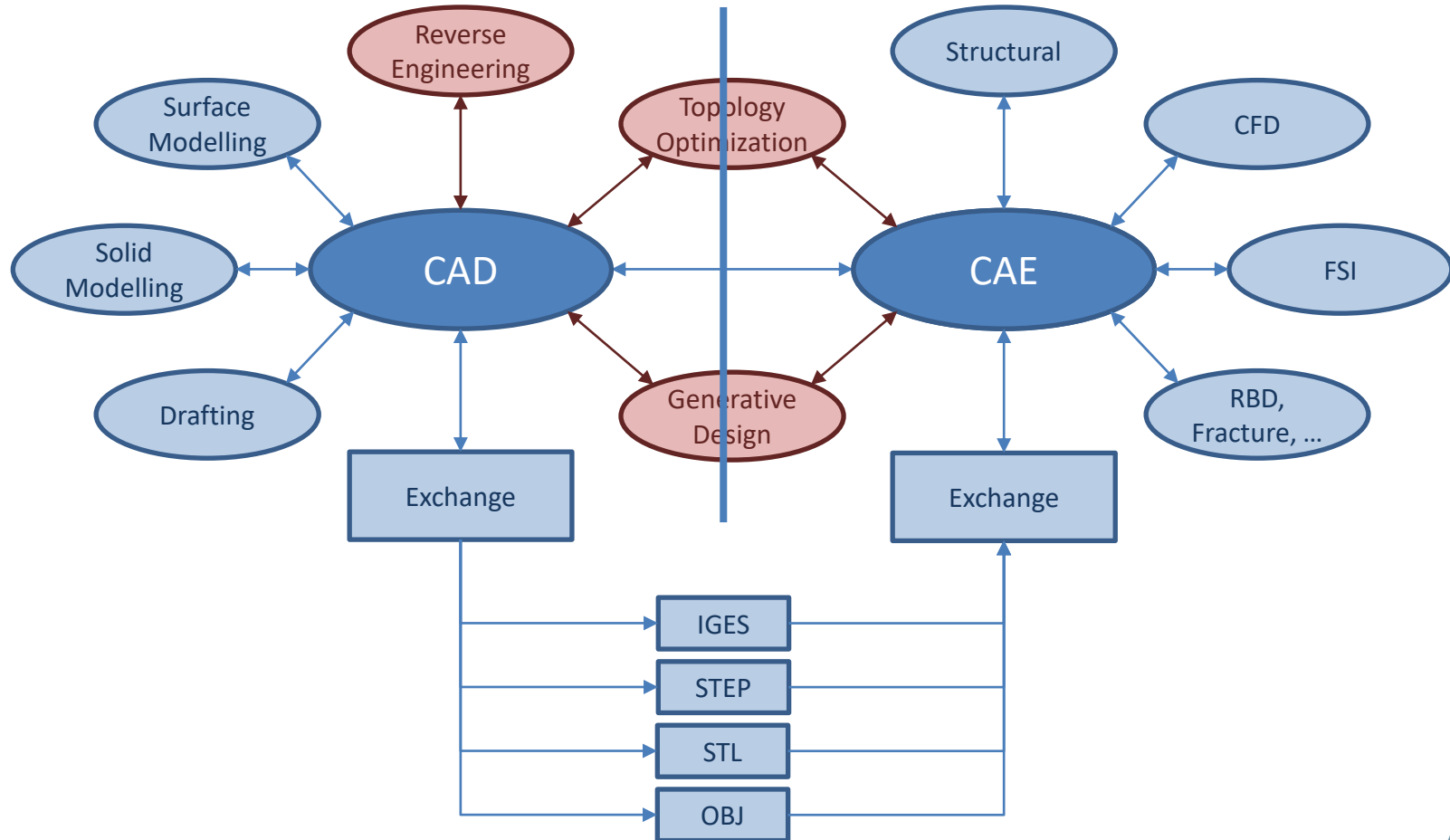
The Workflow (CAD & CAE)



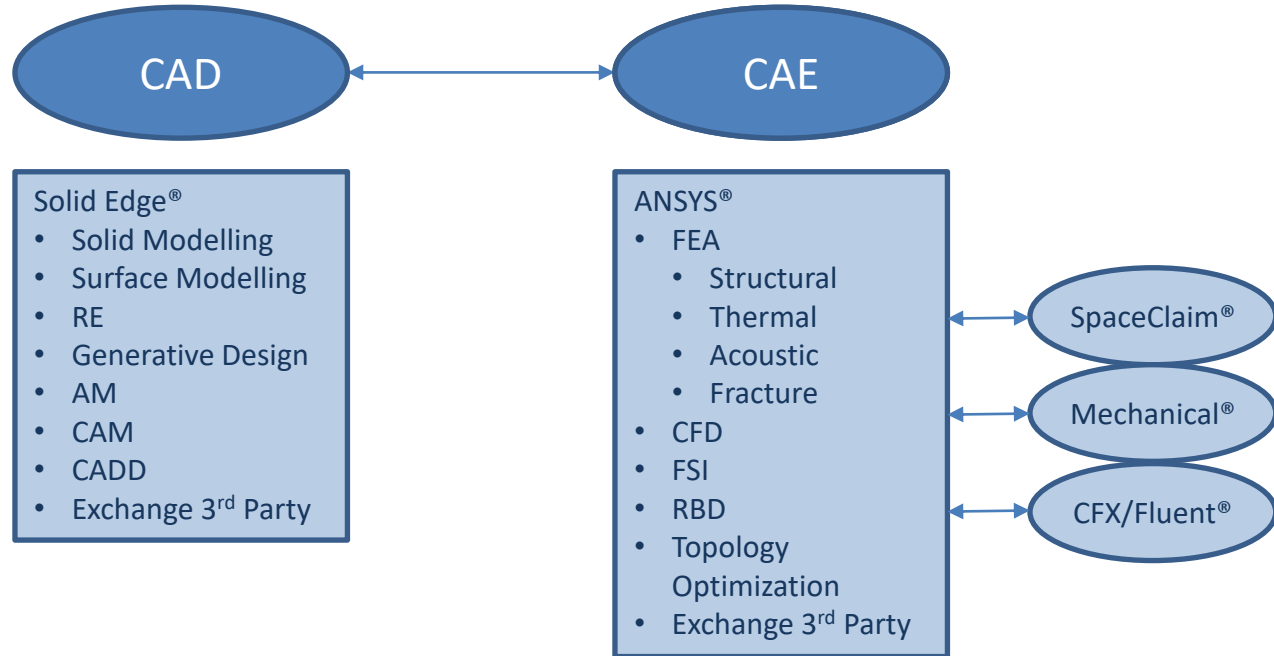
CAD & CAE ecosystem in the past



Integrated CAD & CAE

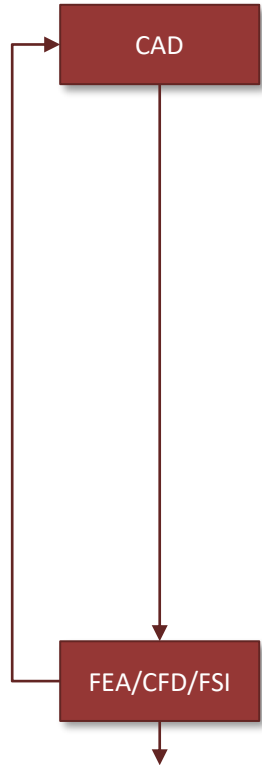


Integrated CAD & CAE, an approach

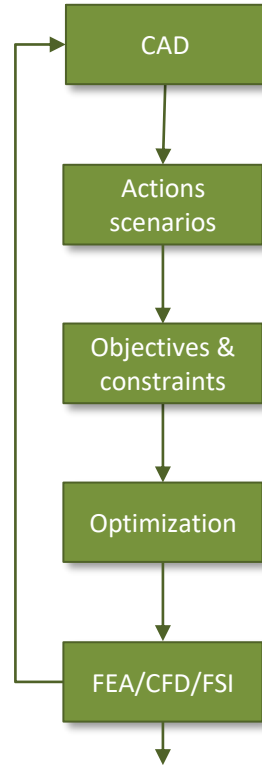


CAD & CAE workflows

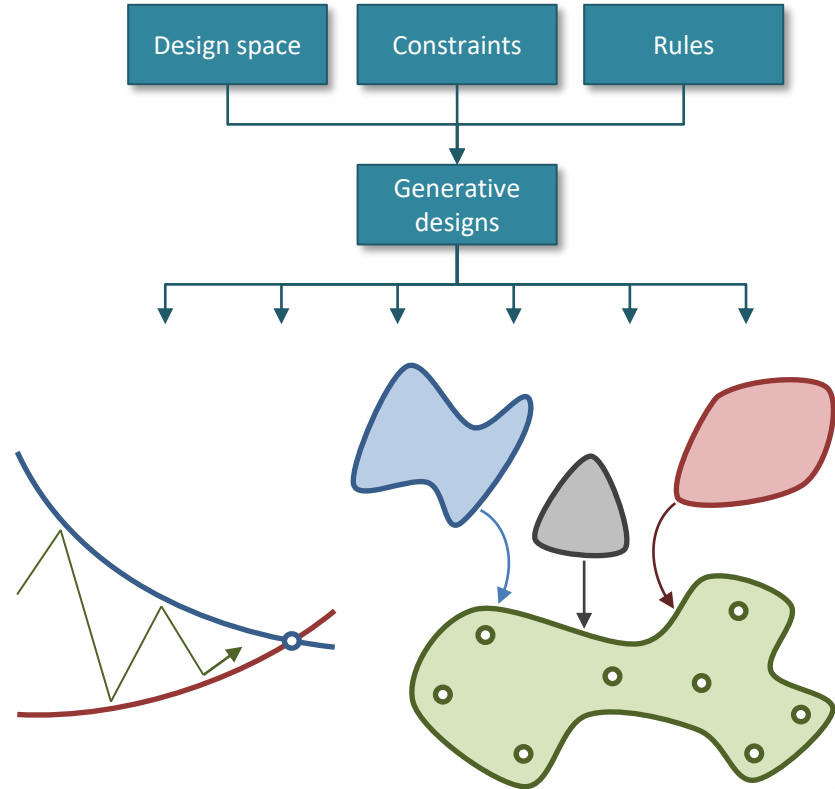
Traditional
experience / intuition



Topology optimization
function minimization

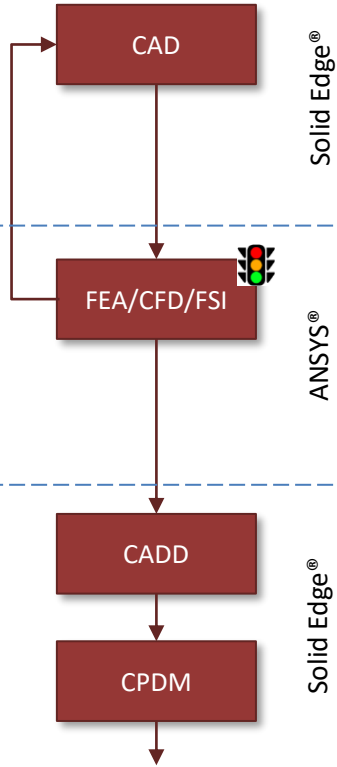


AI based
heuristic

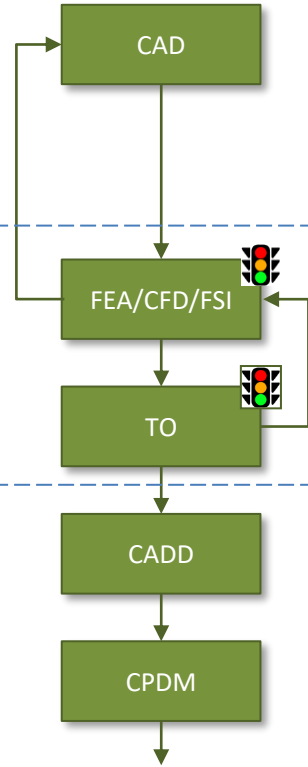


CAD & CAE workflows: Solid Edge® + ANSYS®

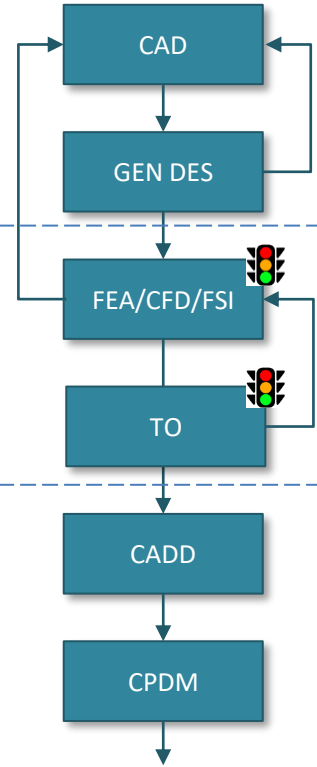
Traditional
experience / intuition



Topology optimization
function minimization



AI based
heuristic



GEN DES & TO criteria & constraints

Objective criteria:

- Stiffness
- Mass
- Stress
- Deflection
- Durability

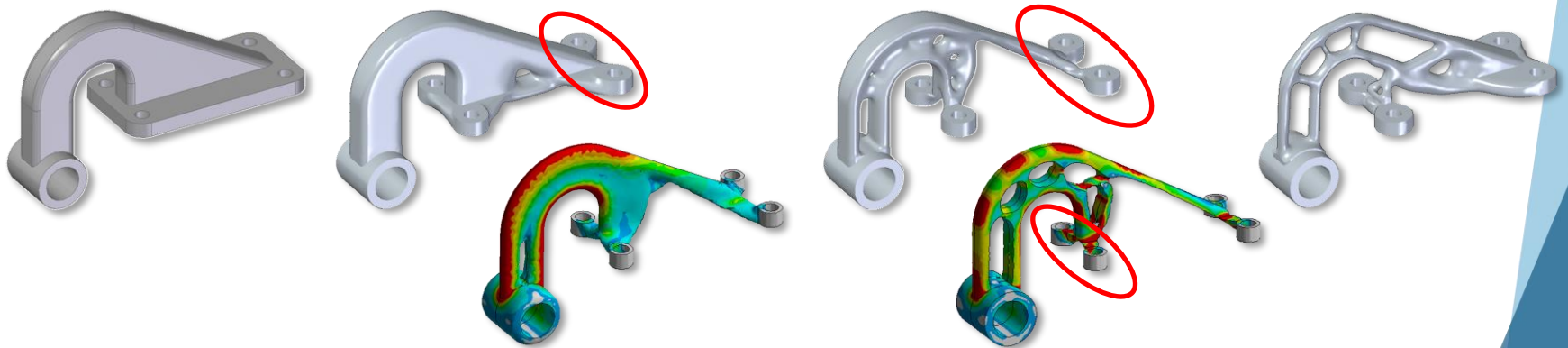
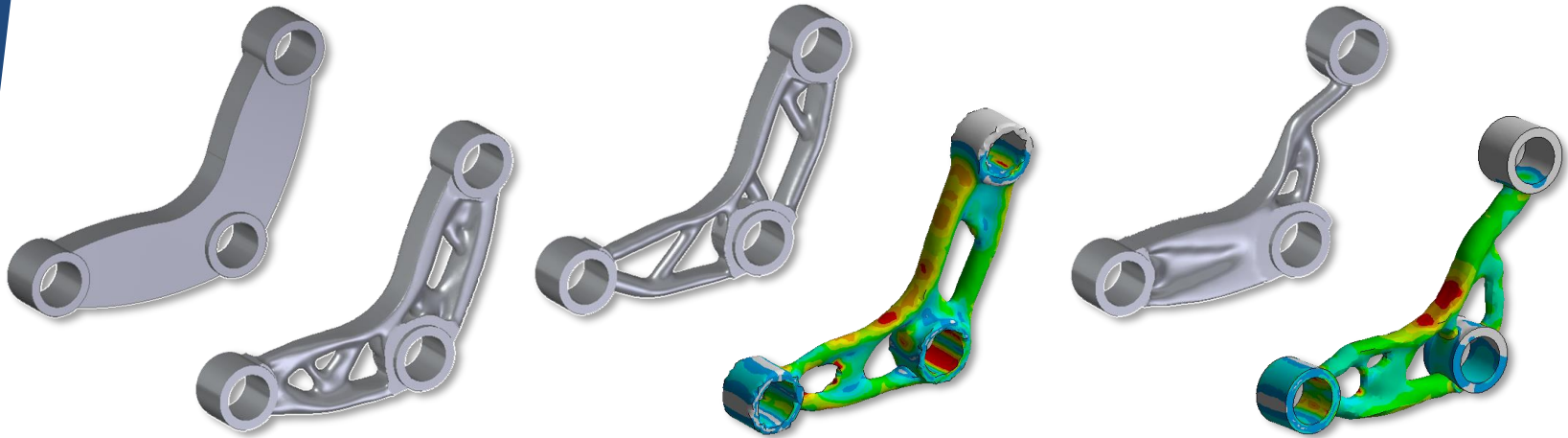
Response constraints:

- Mass
- Volume
- Stress
- Displacement
- Reaction force
- Natural frequency
- Inertial constraint

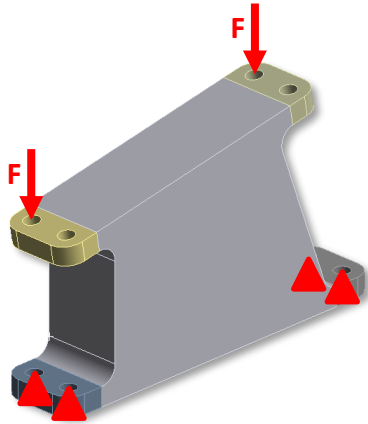
Manufacturing constraints:

- Technology
 - Casting
 - AM
 - Extrusion
 - Machining
- Material type
- Material distribution
- Member section
- Pull out direction
- Split location
- Overhang limit

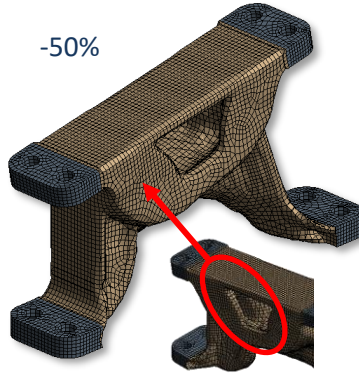
Objective criteria & response constraints variations



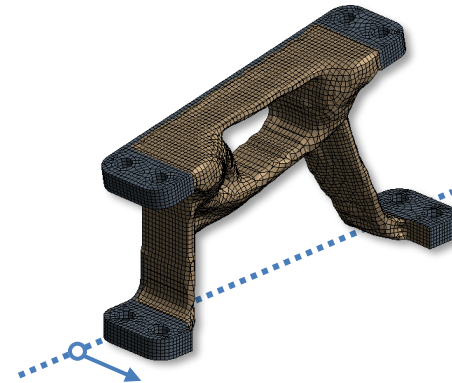
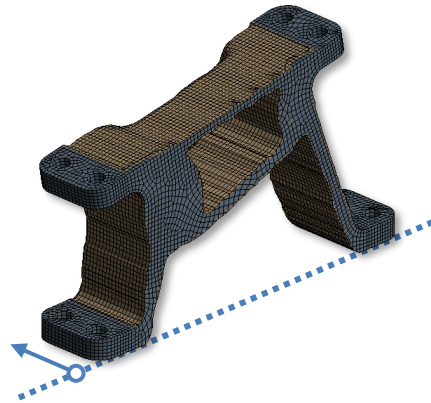
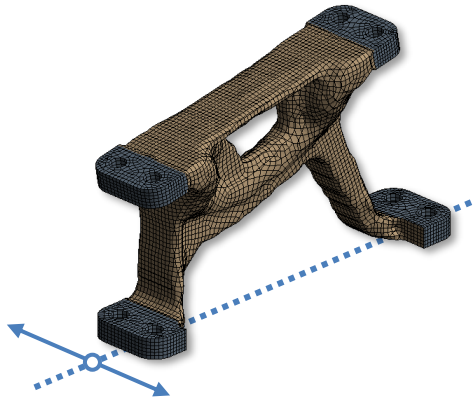
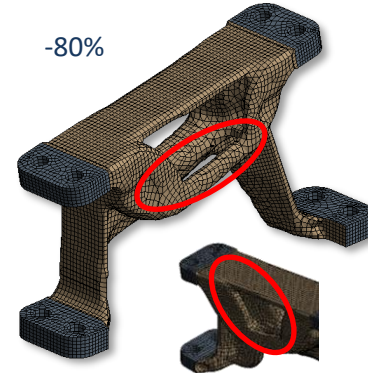
Objective criteria & manufacturing constraints variations



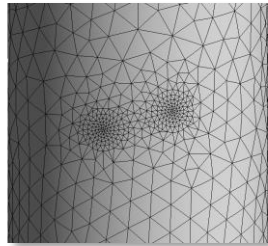
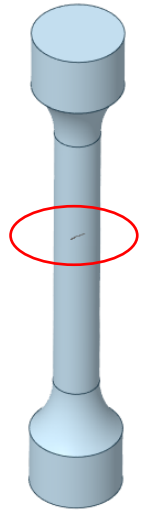
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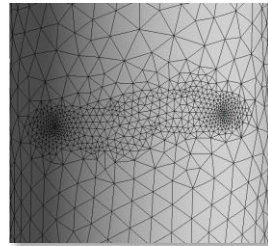
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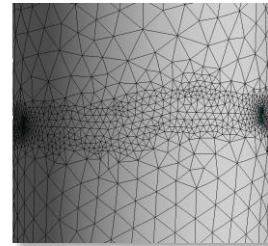
Manufacturing defects & failure investigations



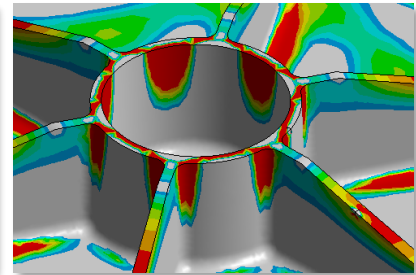
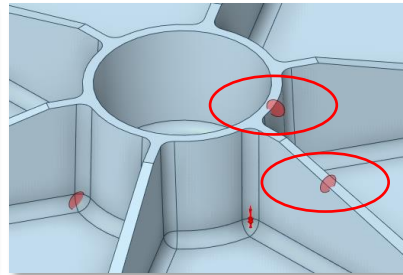
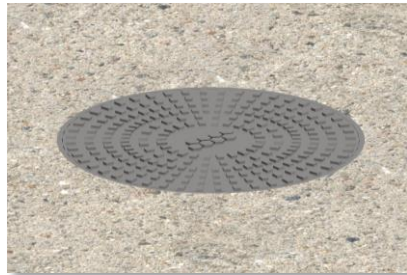
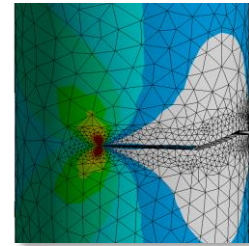
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50%



100%



Benefits of GEN DES and TO with integrated CAD & CAE systems

- Shortened time from concept to launch
- Reduced development costs
- Reduced need for design revisions
- Increased productivity and quality
- Increased reliability of the product
- Comprehensive understanding of structural failure modes
- Reduced manufacturing and product costs
- Drives innovation



Q & A