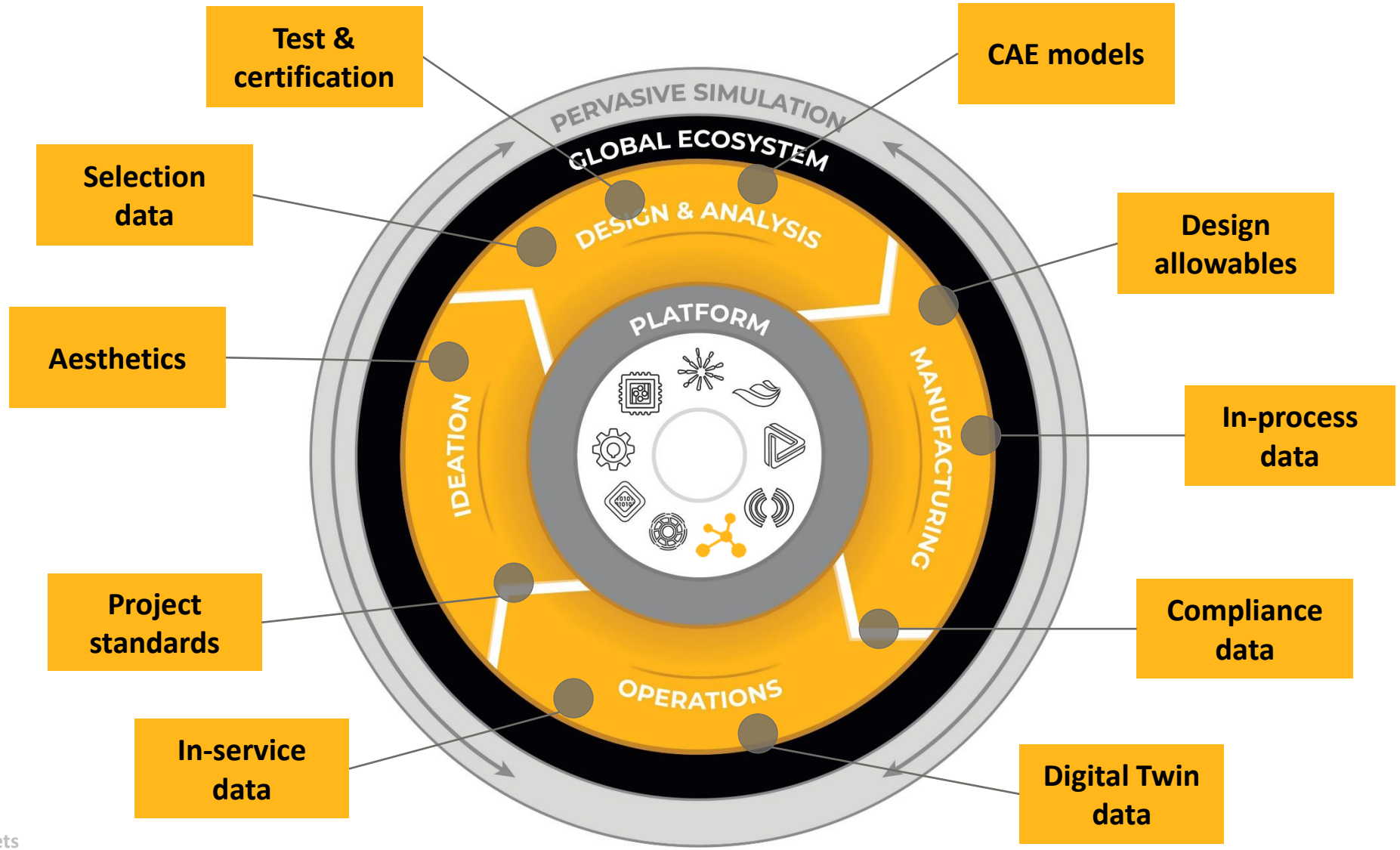
Material’s as a tool for Digital Transformation

9/20/2023

Materials information across the design cycle…



Example material data sets

… how materials information has been managed

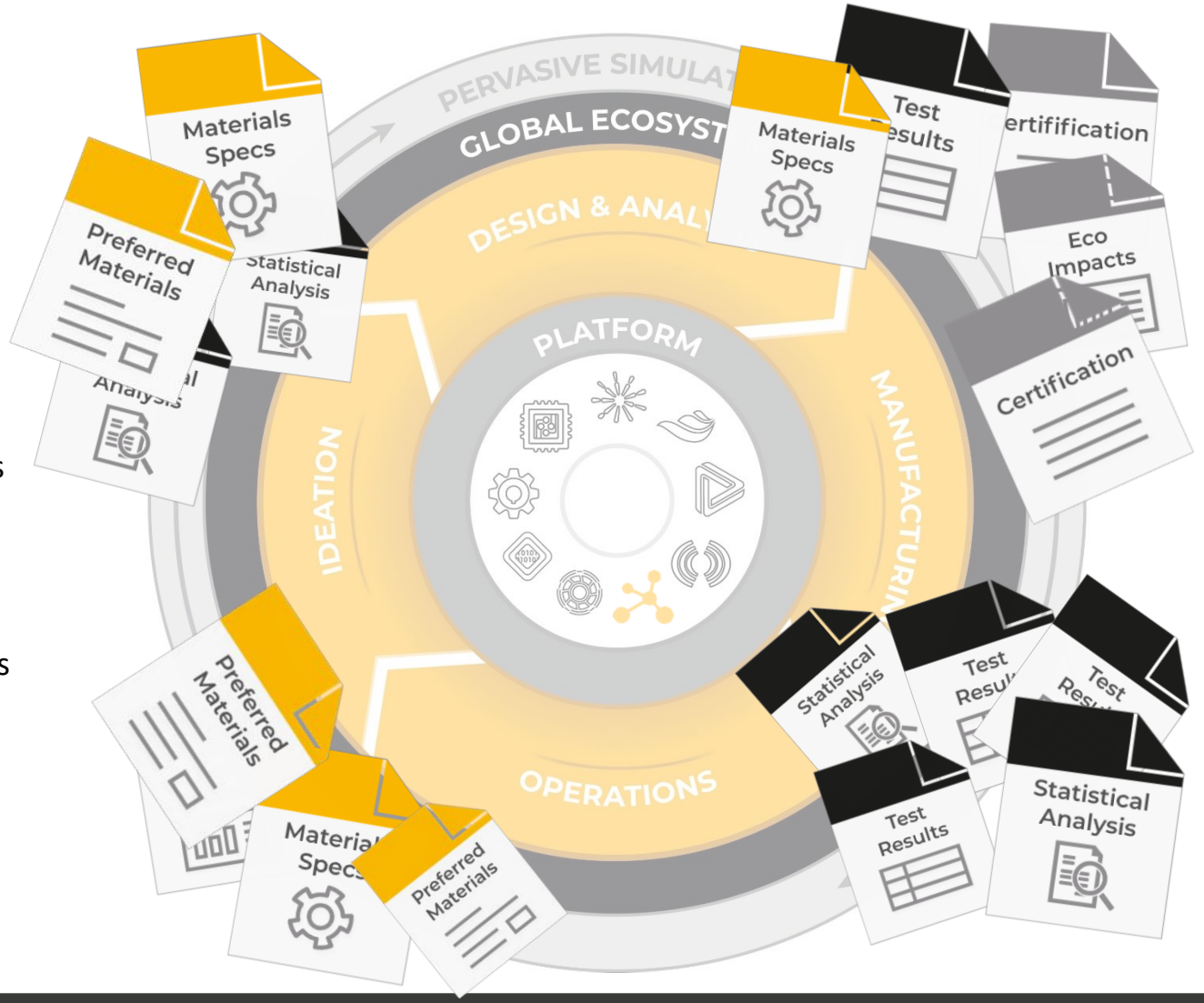
SharePoint

Database

Personal computers

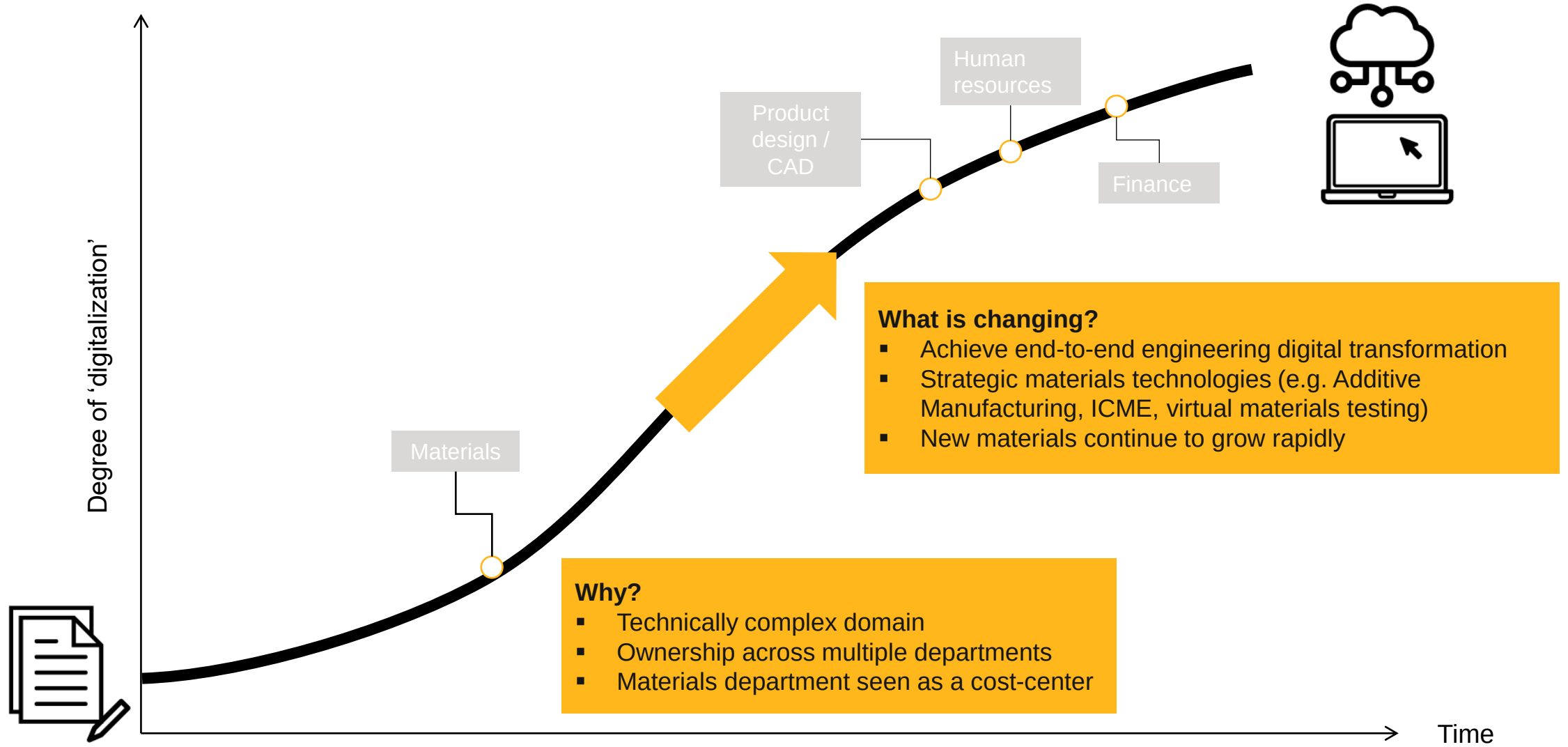
Insecure hard drives

Paper documents



Insecure
Inefficient
Insular

Materials is the next step for digital transformation



What is changing?

- Achieve end-to-end engineering digital transformation
- Strategic materials technologies (e.g. Additive Manufacturing, ICME, virtual materials testing)
- New materials continue to grow rapidly

Why?

- Technically complex domain
- Ownership across multiple departments
- Materials department seen as a cost-center

Spotting enterprise materials information challenges

Regulatory Non-Compliance
High corporate liability risk if a restricted substance is used.

Unsustainable Design
Corporate goals on recyclability and carbon neutrality are difficult to measure without the right material data.

Wrong Material
Impacts product performance and quality resulting in a recall or high warranty cost

Unreliable Simulation
Inconsistent materials data leads to repeat simulations - resulting in products late to market.

High Material Cost
Raw material is typically the #1 or #2 cost for a manufacturer – eroding product margin.

Duplicate Testing
High spend on repeat testing because material testing data is not captured.

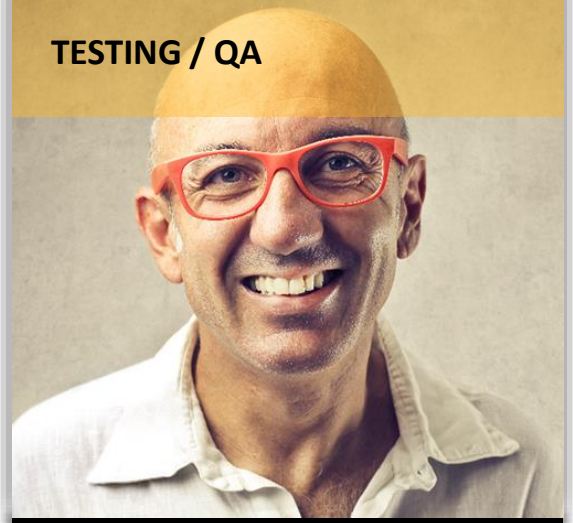
Siloed Teams
Poor visibility of data used across engineering teams with different naming conventions.

Dispersed Data
Vital materials IP is being lost because of poor information management and storage

Image source: https://infotron.com.tr/

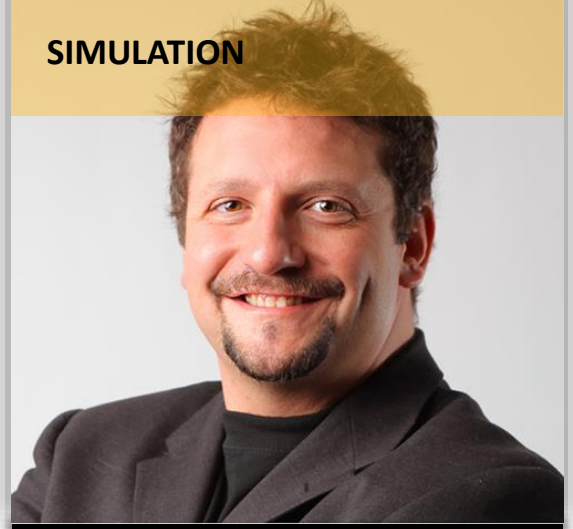
How much can these challenges cost?

TESTING / QA



“We found duplicated testing was costing us $200k per year

SIMULATION



“Lost material assignments between CAD and CAE cost a day for every part

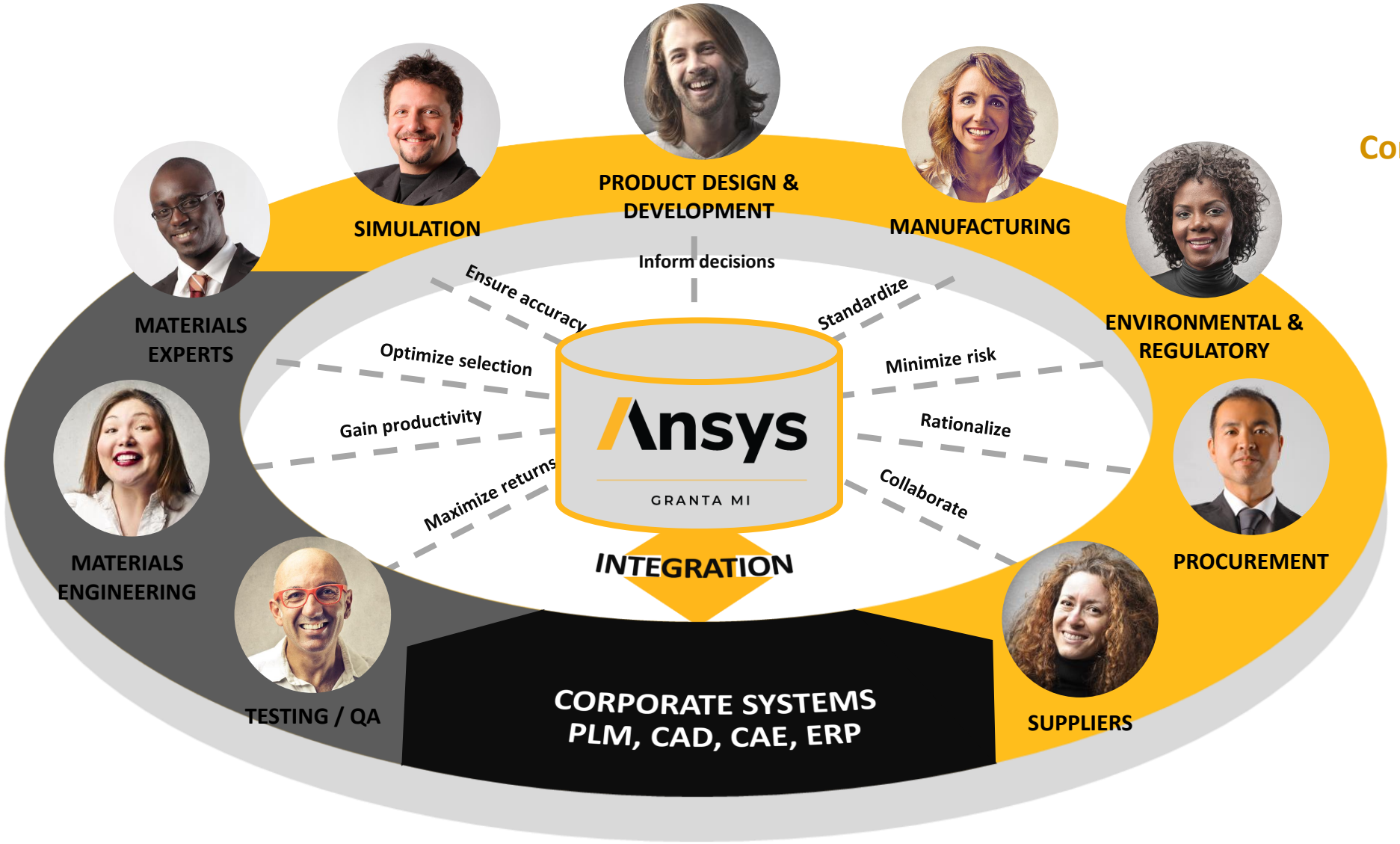
MANUFACTURING & PROCUREMENT

“Two factories made the same part with different materials – it cost us > $1m

ENVIRONMENTAL & REGULATORY

“A material choice introduced a restricted substance, leading to a product recall.

Granta MI – The Authoritative Source of Materials Data



Images: licensed from Shutterstock

All your material data in one place

Aesthetics	Material properties	Supplier specifications
Detailed engineering properties	Simulation models	Testing and analysis
In-service data	Compliance data	

MaterialUniverse™

JAHM curve data

Additive Manufacturing | Aero | Composites | Eco | Electro-magnetics

ESDU | High Temperature Alloys | Medical | Metals | Polymers

Proprietary materials information

Ansys GRANTA MI

Comprehensive Material Library
of reference information:
Metals, plastics, composites…

Additive Manufacturing Template

Composites Template

Metals Template

AI/ML

Restricted Substances

PLM Sync

An unrivalled library of materials property data

Core Materials Data

Included in Granta MI and Granta Selector

- MaterialUniverse™
- JAHM curve data

Advanced Materials Data

Purchased as collections for Granta MI and Granta Selector

- Additive Manufacturing
  - Senvol Database™
- Aero
  - MMPDS
  - Coatings
- Composites
  - Mil-Handbook-17
  - Firehole Composites
  - Composites QED†
- Eco
- Electro-magnetics
- ESDU
- High Temperature Alloys
- Medical
  - ASM Medical Materials
  - Human Biological Materials†
- Metals
  - Global Metals Specifications
    - ASME BPVC
    - Sheet Steels
    - Powder Metallurgy
    - NIMS Creep & Fatigue†
- Polymers
  - Global Polymers

Materials Data for Simulation

Simulation-ready data in Ansys flagship products

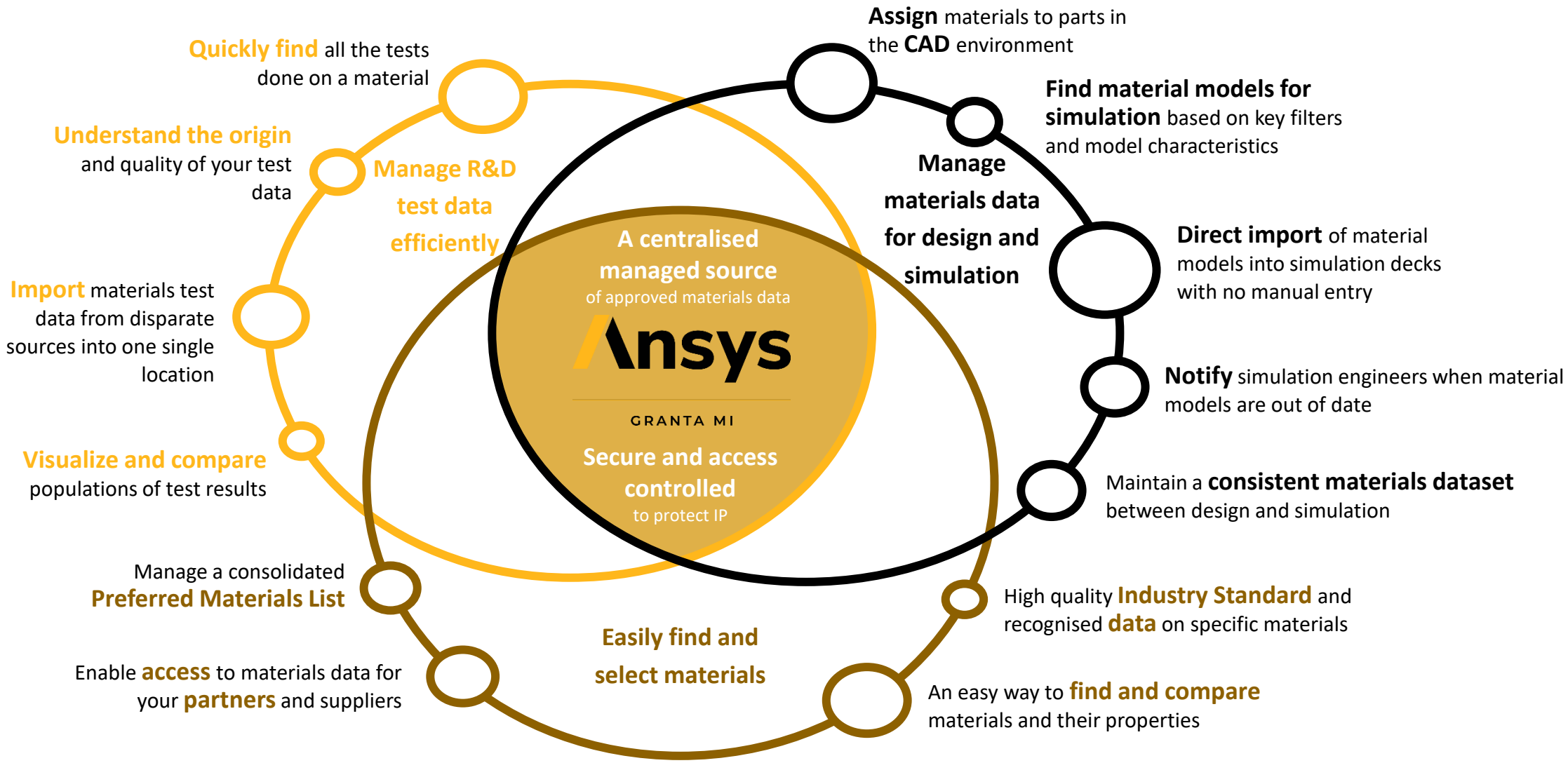
Restricted Substances†

Best practices for managing critical chemicals and substances risks in MI

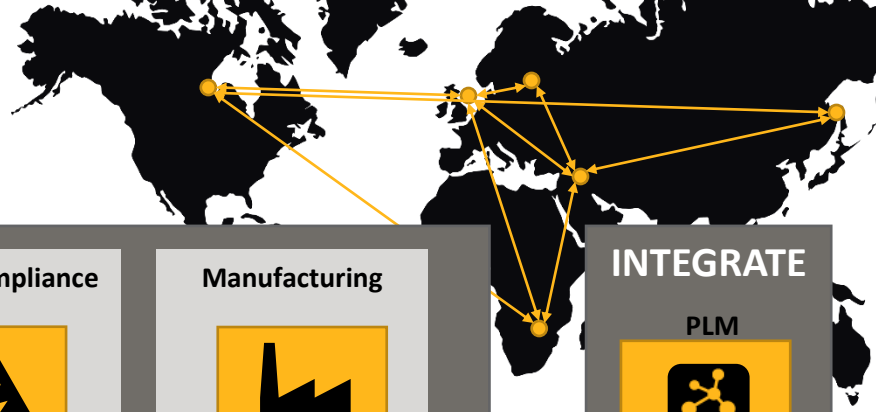
Access materials data natively in Ansys products with integrated Granta MI gateways
Export key materials property data to Ansys applications

† Granta MI Enterprise only

Key Use Cases Supported



Enterprise-wide materials information



EXTENDED TEAMS

Test data management

Materials Authority

Field Operations

PRODUCT DEVELOPMENT

Design & CAD

Simulation

Risk & Compliance

Manufacturing

Granta MI™

Materials Information Management System

Version + Access

API + Scripting

PLM

SPDM

ERP

R&D

Additive Manufacturing

Composites

Metals

INTEGRATE

PLM

ECT

Web browser

In-tool Gateways

GWY

Export & download

MCC

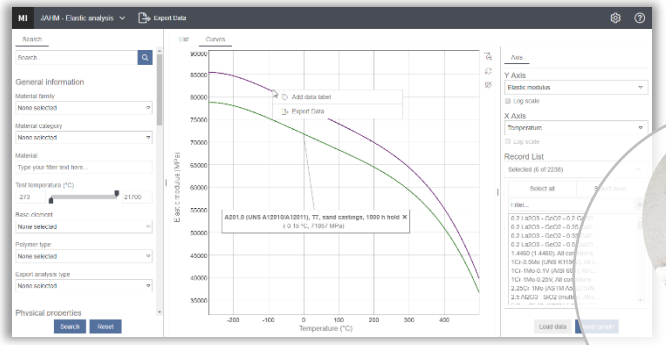
Ansys platform

AM

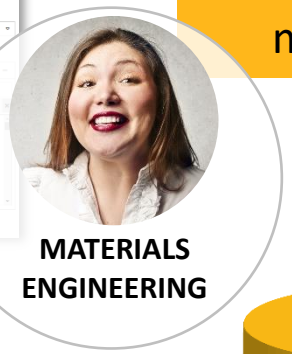
Ansys

Making the user experience as easy as possible.

Based on a ‘single view of the truth’ for materials

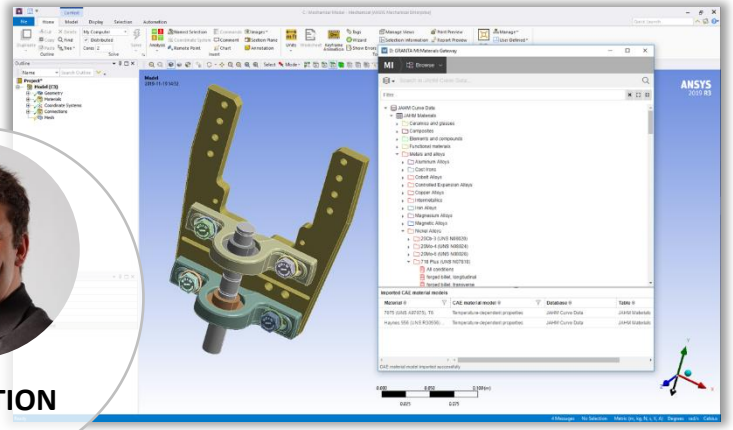


Analyze property data



MATERIALS ENGINEERING

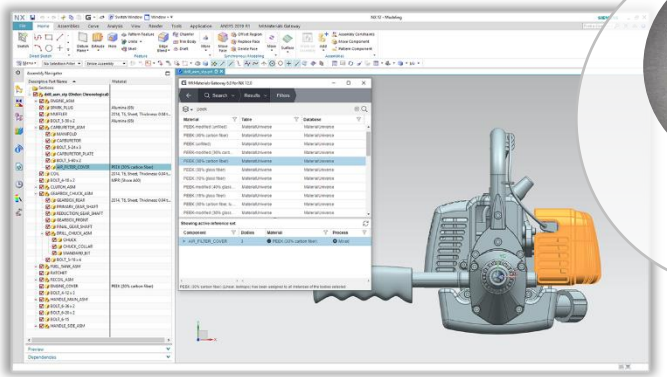
SIMULATION



Integration with CAE

MI

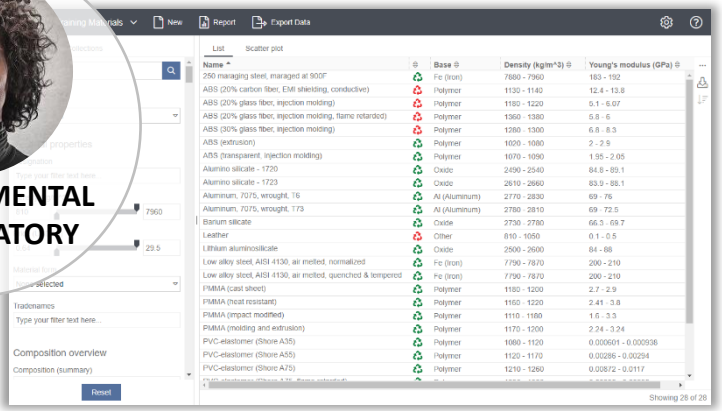
CORPORATE MATERIALS INFORMATION



Guided materials assignment in CAD/PLM

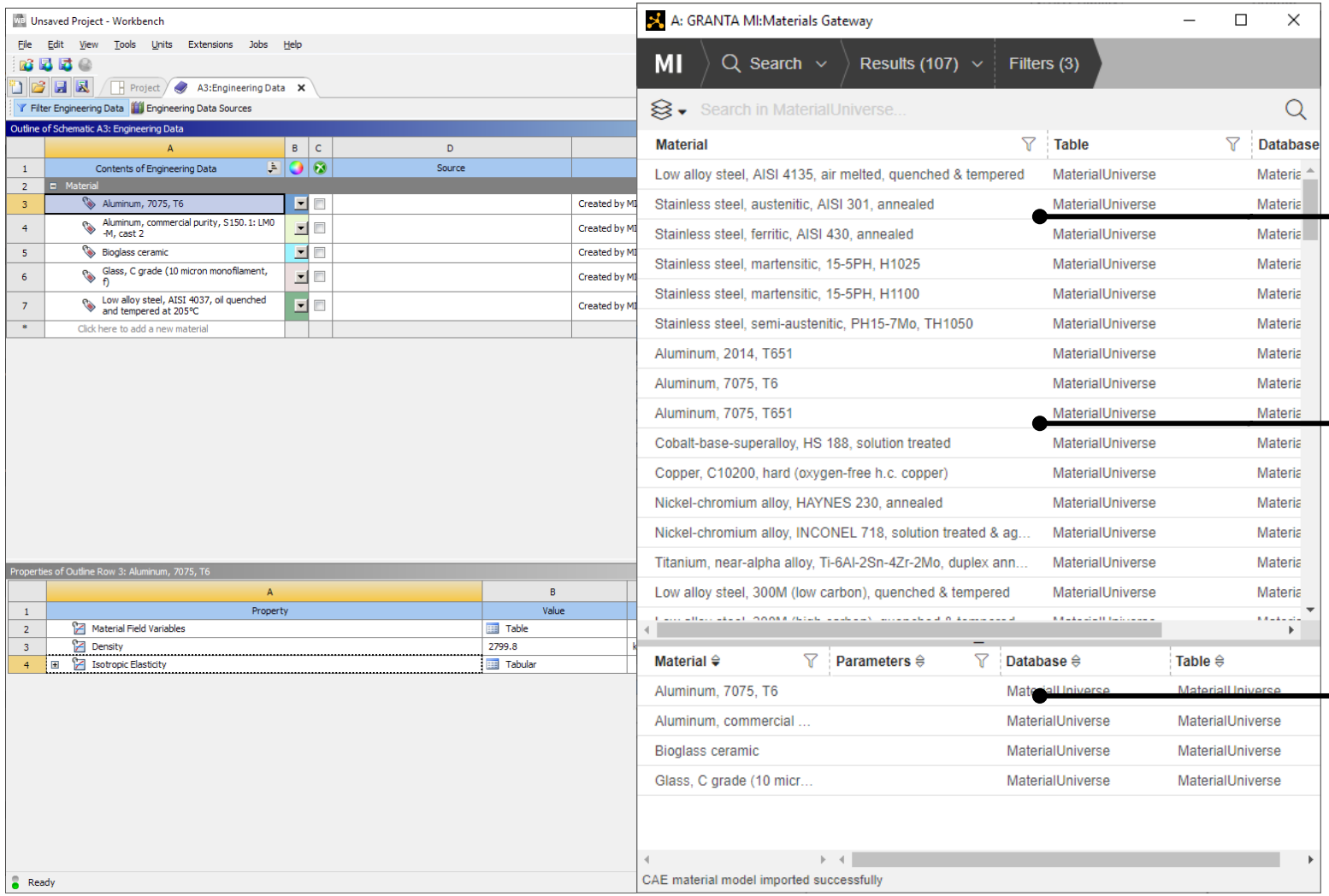
PRODUCT DESIGN

ENVIRONMENTAL & REGULATORY



Assess product risk

Assign materials directly in Ansys Workbench



Access

Instant access to the data when and where needed.

Traceability

Ensure the traceability and consistency of the data used in all design decisions.

Searchability

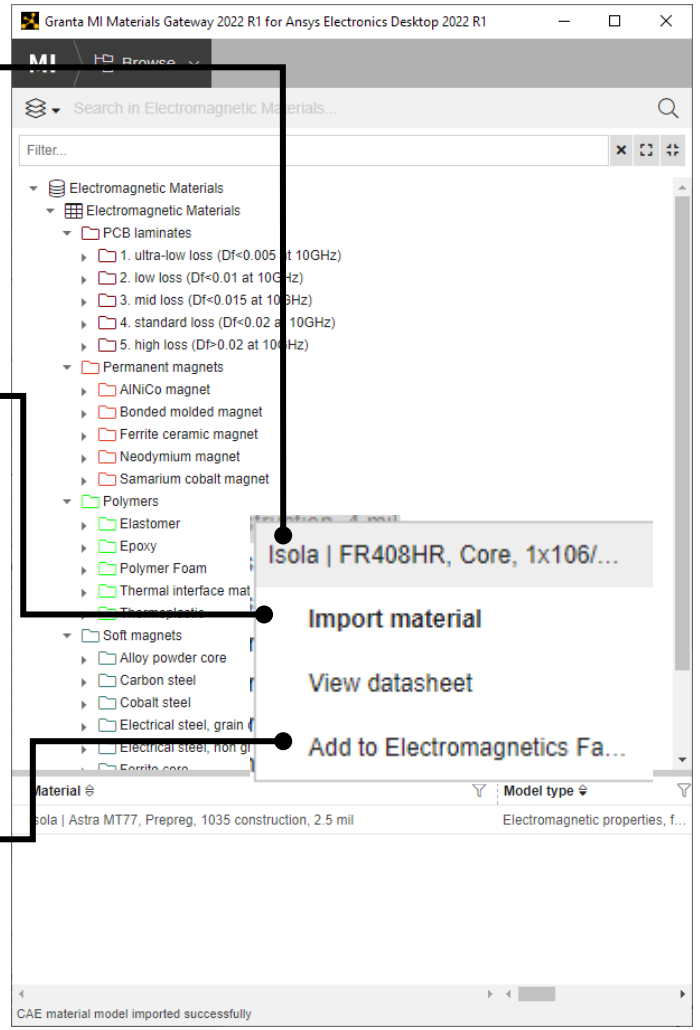
Set search criteria or browse to identify the right material for simulation.

Assign materials directly in Ansys Electronics Desktop

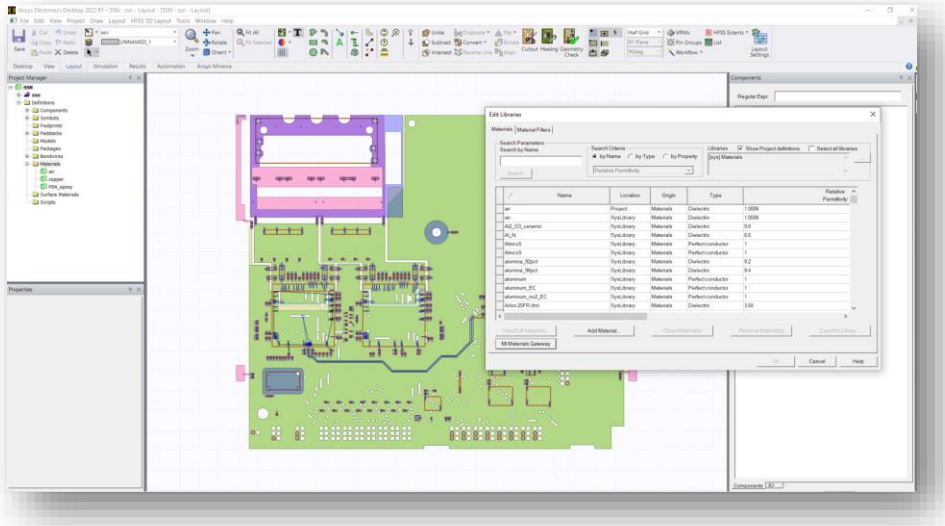
Change notification
Get notified when the material data is updated.

Material models
Find the right data models for simulation when and where required.

Favorites
Fast assignment from favorites list.



> Guarantee the approved material is used every time



Integration with Ansys Discovery

Access

Instant access to the data when and where needed.

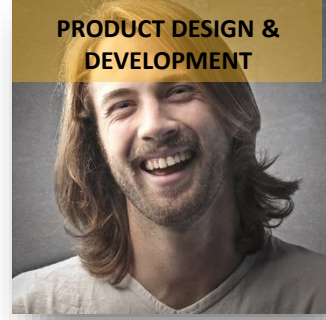
Traceability

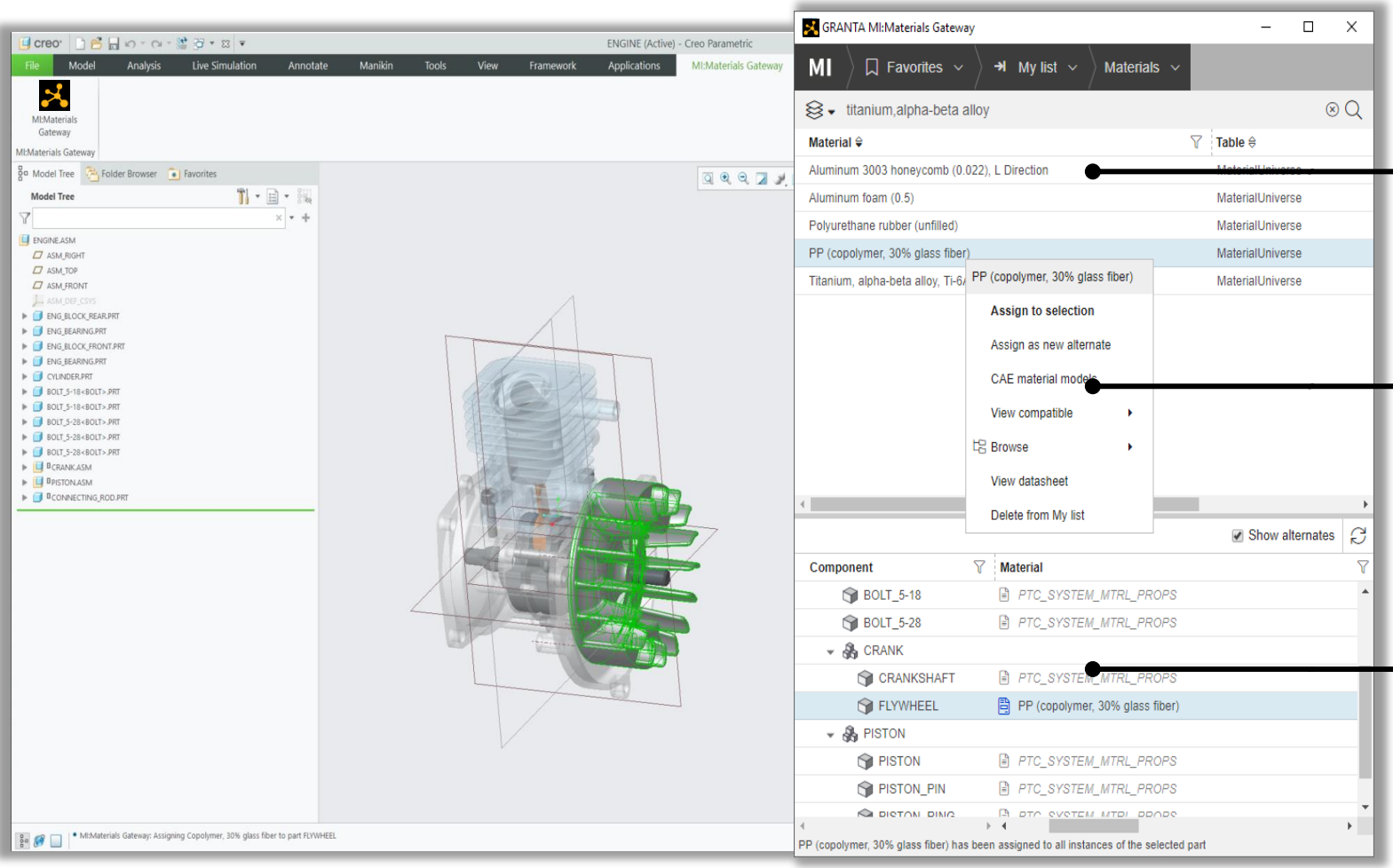
Ensure the traceability and consistency of the data used in all design and simulation decisions.

Native connection

Ansys Discovery enabled functionality to allow material data search and import.

Assign materials directly in Creo Parametric





Access
Instant access to the data when and where needed.

Traceability
Ensure the traceability and consistency of the data used in all design decisions.

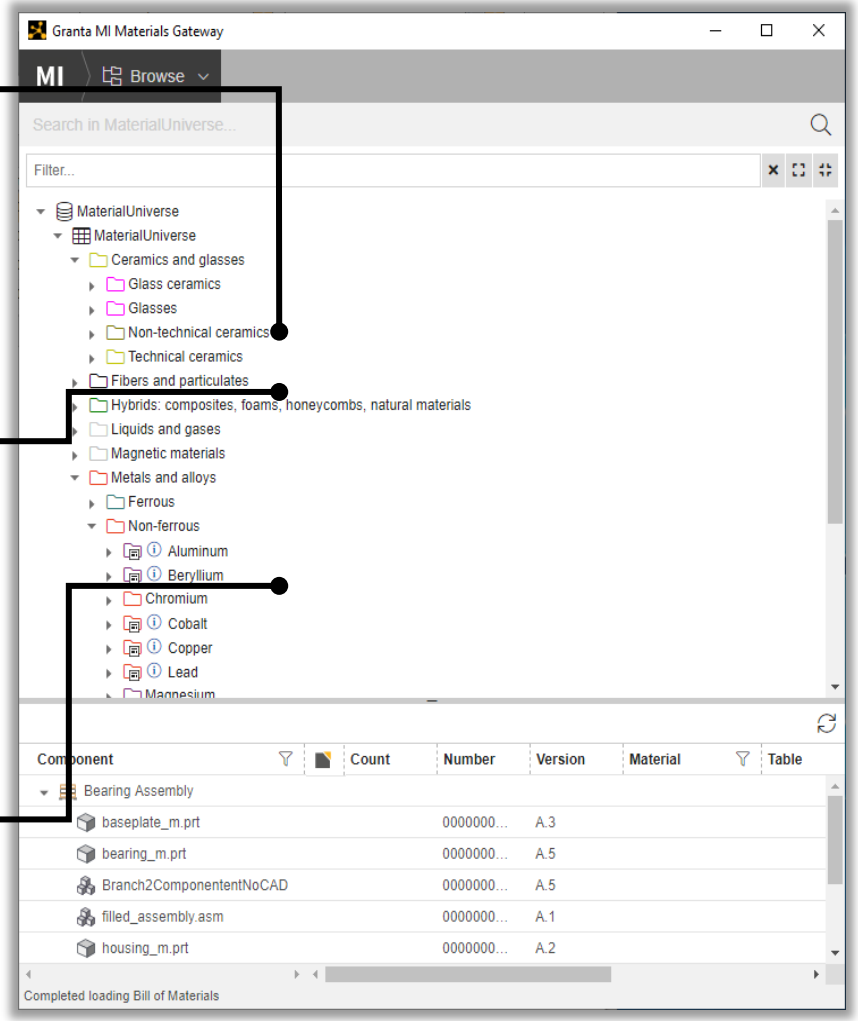
Integrity at Design
Establish systematic material selection to satisfy design requirements.

Assign materials directly in Windchill

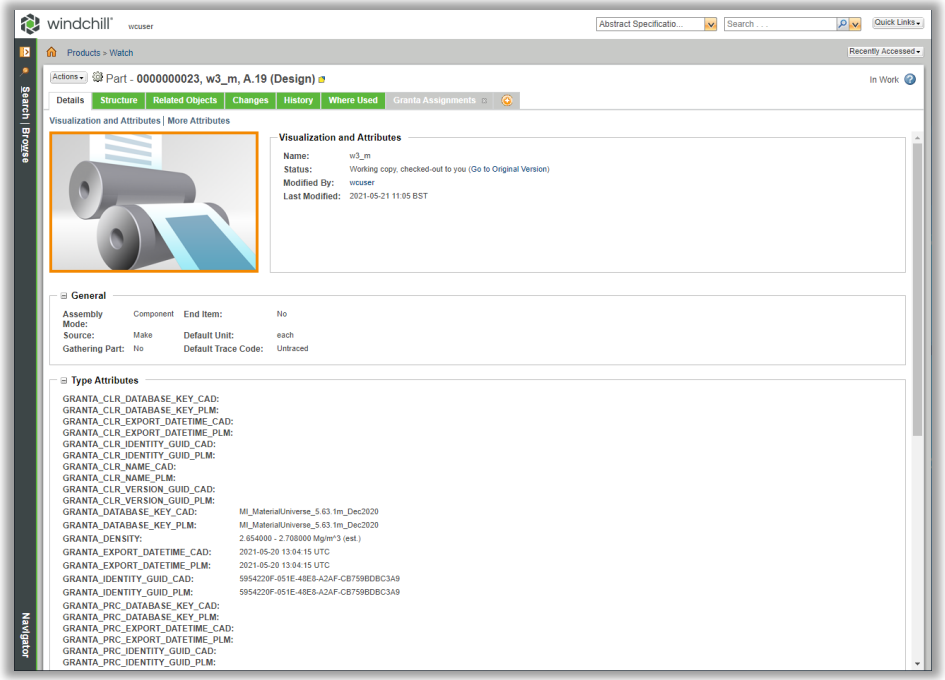
Change notification
Get notified when the material data is updated.

Assign alternate
Instant access to the data when and where needed.

Favorites
Fast assignment from favorites list.



"Guarantee the approved material is used every time



Scripting Toolkit for Python


```
In [7]: graph = value.floatFunctionalSeriesDataType.graph
        series = graph.series

        curves = []

        for curve in series:
            points = curve.XYPoints.XYPoints
            x = [point.parameterValue.numericValue for point in points]
            y = [point.Y for point in points]
            curves.append([x,y])

        print(curves)
```

```
[[[0.0, 0.884463, 0.889755, 0.890251, 0.890748, 0.891246, 0.922673, 0.937986, 0.96068, 0.986228, 1.00829, 1.02755, 1.0414, 1.05
956, 1.07409, 1.08701, 1.11642, 1.14737, 1.17464, 1.20351, 1.23038], [0.0, 1731.86, 1733.01, 1733.87, 1734.72, 1735.58, 1786.9,
1809.62, 1840.22, 1870.26, 1892.73, 1910.05, 1921.33, 1934.84, 1944.71, 1952.89, 1969.64, 1984.99, 1996.96, 2008.33, 2017.92]]]
```

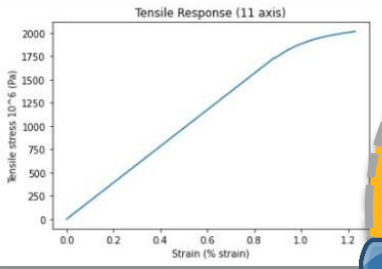
Plot the curves using the matplotlib package.

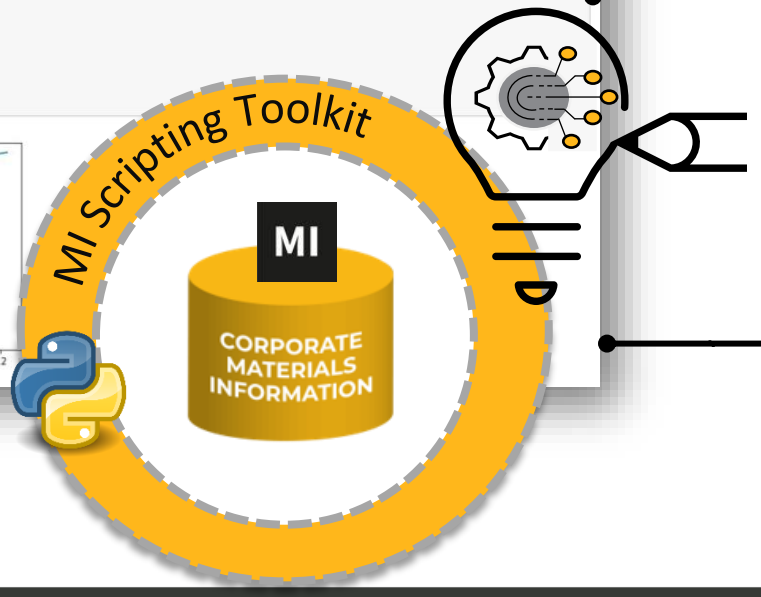
```
In [8]: import matplotlib.pyplot as plt

        x_label = '{param.name} ({param.unit.unitSymbol})'.format(param = graph.XAxisParameter)
        y_label = 'Tensile stress 10^6 (Pa)'

        fig = plt.figure()
        ax = fig.add_subplot(111)
        ax.set_xlabel(x_label)
        ax.set_ylabel(y_label)
        ax.set_title('Tensile Response (11 axis)')

        for curve in curves:
            ax.plot(curve[0], curve[1])
```





Access to integrate

Instant access to your GRANTA MI gold-source of materials information so you can integrate with in-house analysis scripts without the need to copy/paste data.

Automation

Automate materials-related business processes by exposing your GRANTA MI data and workflows to the power of python programming.

Consistency

Ensure the consistency of the data used by gaining access to the latest approved material data.

Integration Capabilities Chart

- MI Materials Gateway
- Platform integration
- Python Scripting Toolkit
- MI Material Card Connect (PLM Sync)
- MI Enterprise Connect (PLM Sync)
- File exporter

Design, Simulation, and PLM software		Granta MI Enterprise
Ansys	Workbench	GWY
	Electronics Desktop	GWY
	Discovery	
	LS-DYNA (via supported pre-processor)	GWY
	Minerva	MI AM
	optiSLang	oSL
Altair	HyperMesh	GWY
BetaCAE	ANSA	GWY
DS SIMULIA	Abaqus	GWY
PTC	Creo	GWY
	Windchill	GWY
Siemens	NX & Simcenter 3D	GWY
	Teamcenter	GWY ECT
File Exporter	CATIA V5, SolidWorks, and others	MI MCC
Python STK	Developer tools	STK

Designing for Proactive Sustainability

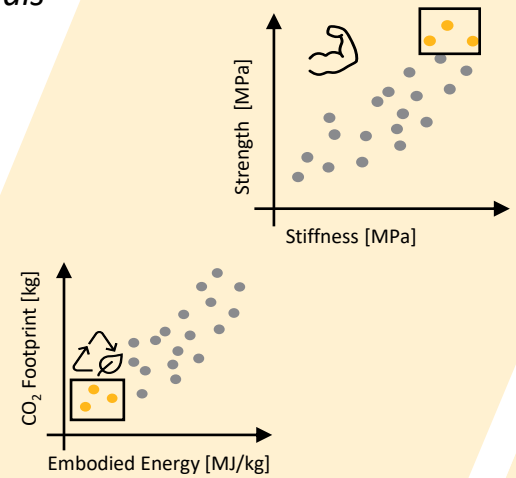
Objective

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

UN Sustainable Development Goals

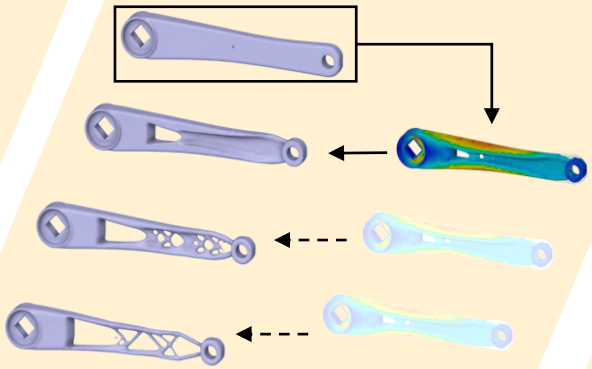
Materials Selection

Using: Granta Selector



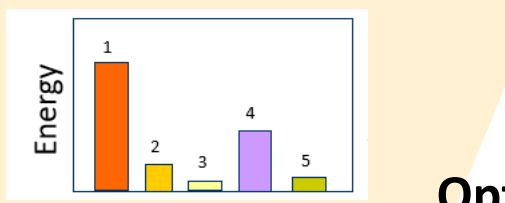
Validation & Design Optimization

Using: Ansys Discovery

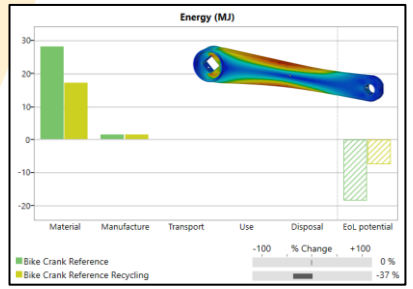


Concept Assessment

Using: Granta Selector Eco Audit



Optimal Design



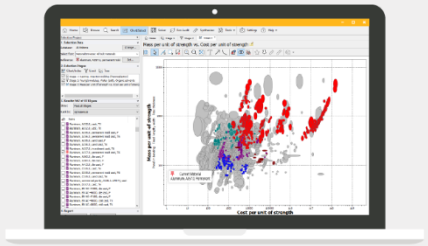
Ansys Granta Product Line

Ansys Granta is our range of market-leading materials information management software solutions. Designed to empower engineers to innovate, simulate and design with more accuracy, consistency and traceability. All with the flexibility of an open Ecosystem.

Granta MDS

Material data to support simulation analysts. Embedded into all Ansys flagship products.

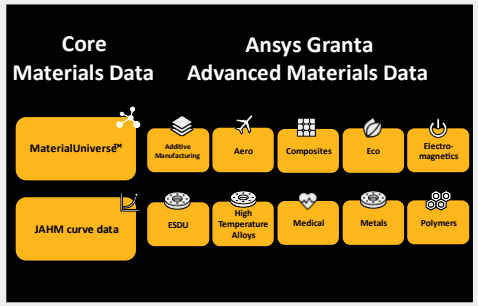
Solves:
- Uncertain data accuracy
- Wasting time formatting data
- Time searching for materials data



Granta Selector

Intelligent material selection using powerful analysis tools with extensive property data.

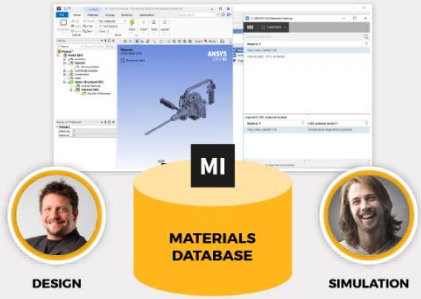
Solves:
- Reduce material cost/weight
- Material supply disruption
- Product recall or material failure



Material Data

An unrivalled library of Advanced material property data ranging from: metals, polymers, aerospace, electromagnetics and more.

Solves:
- Uncertain data accuracy
- Wasting time searching for data
- Lack of specialist material data



Granta MI Pro

Fast-start, out-of-the-box materials information management solution for design and simulation.

Solves:
- Wasted design iterations
- Time wasted searching for data
- Lost in-house material data

Granta MI Enterprise

The comprehensive, market-leading enterprise materials information management system.

Solves:
- Expensive duplicate material tests
- Lost material assignment: CAD-CAE
- Mitigate material non-compliance

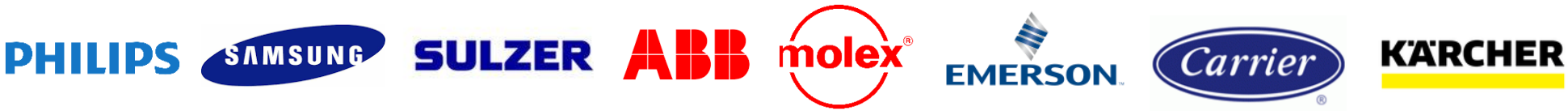
For every industry and customer. No matter what size.

Aerospace & Defense

Energy & Nuclear

Automotive & Off-highway

Industrial & Consumer



Healthcare

Materials producers