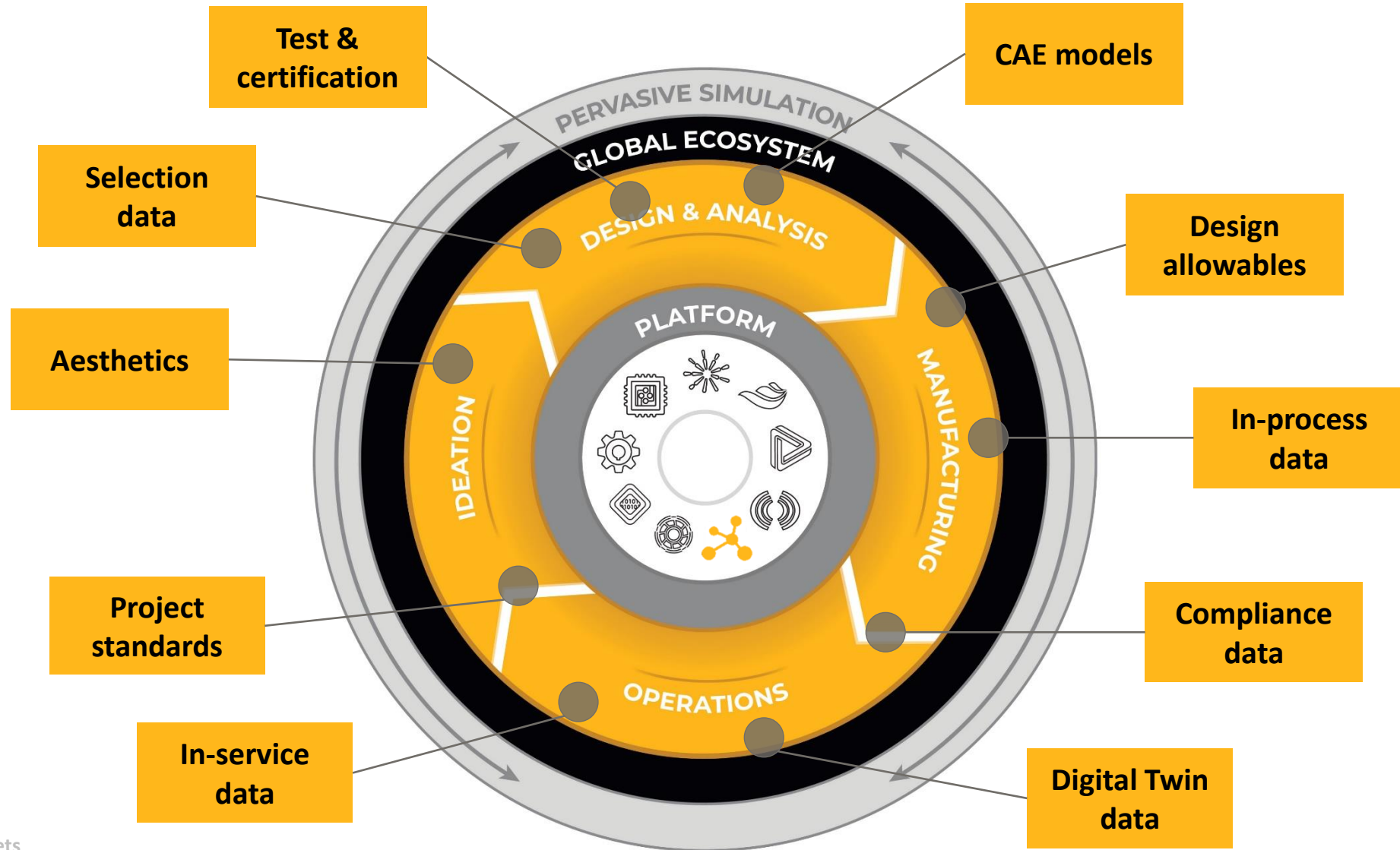


Material's as a tool for Digital Transformation

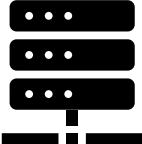
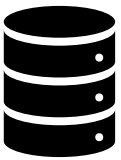

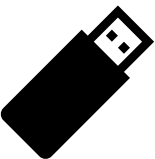

9/20/2023

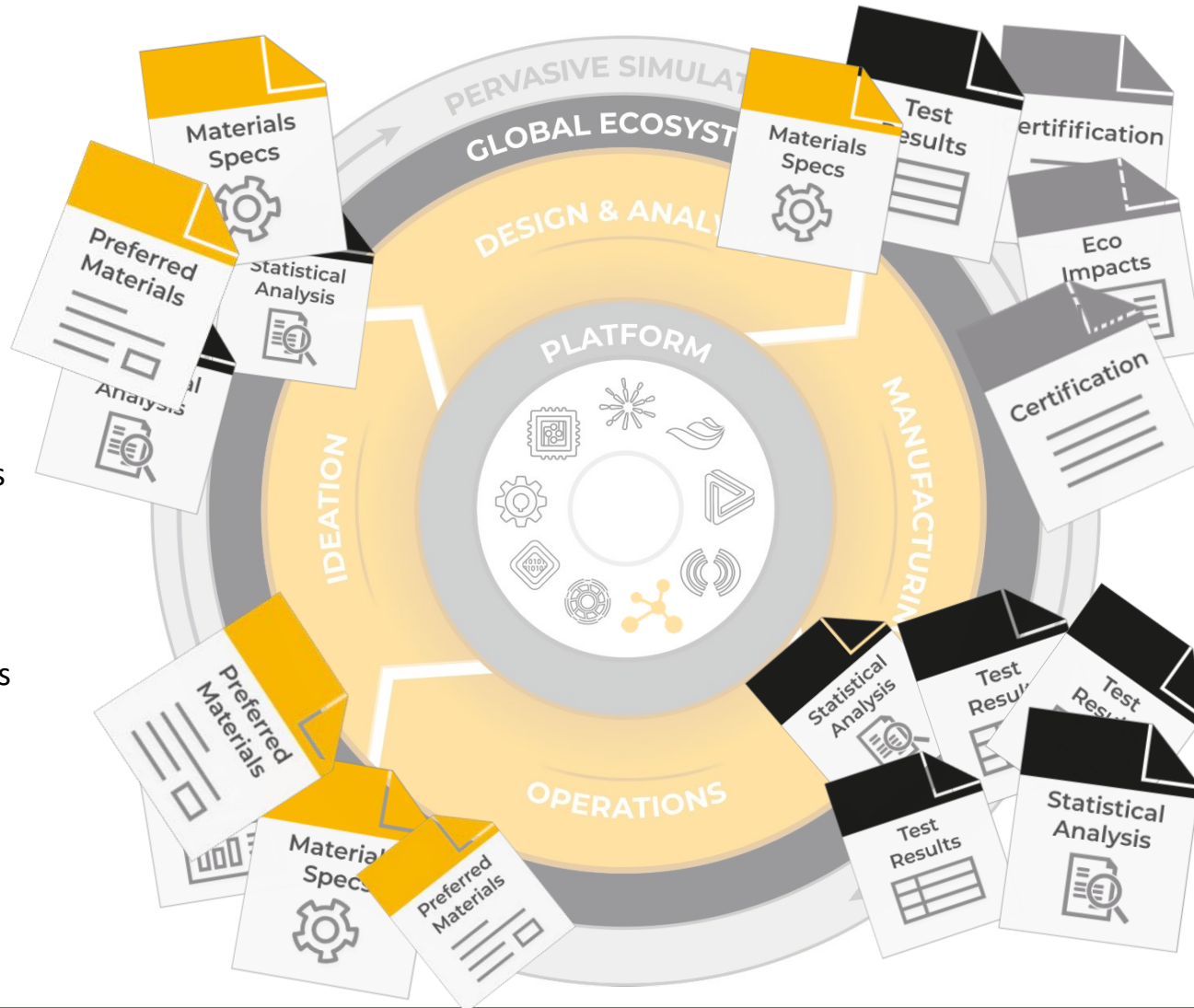
Materials information across the design cycle...



Example material data sets

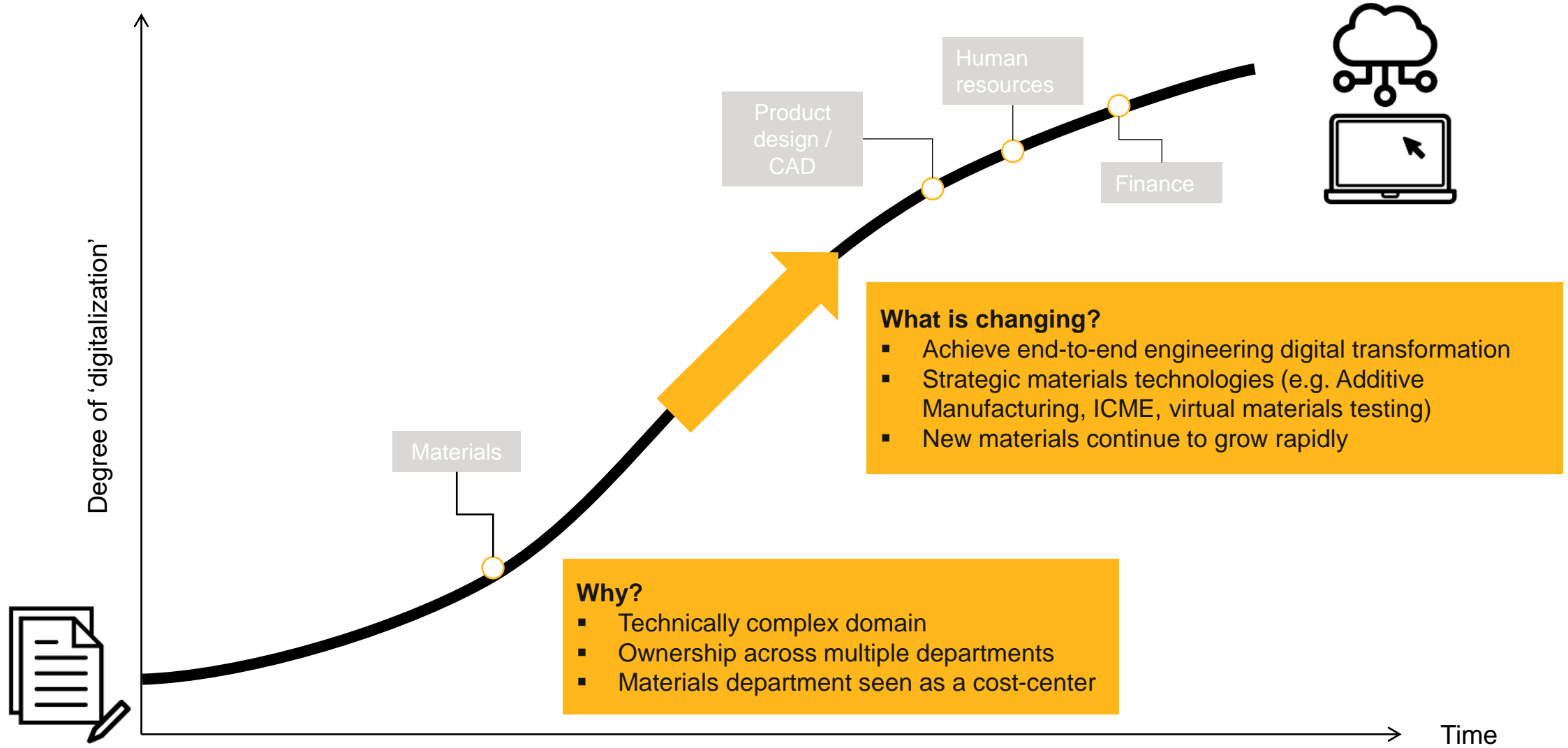
/ ... how materials information has been managed

-  SharePoint
-  Database
-  Personal computers
-  Insecure hard drives
-  Paper documents



Insecure
Inefficient
Insular

Materials is the next step for digital transformation



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



High Material Cost

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



Siloed Teams

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



Unreliable Simulation

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



Duplicate Testing

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



Dispersed Data

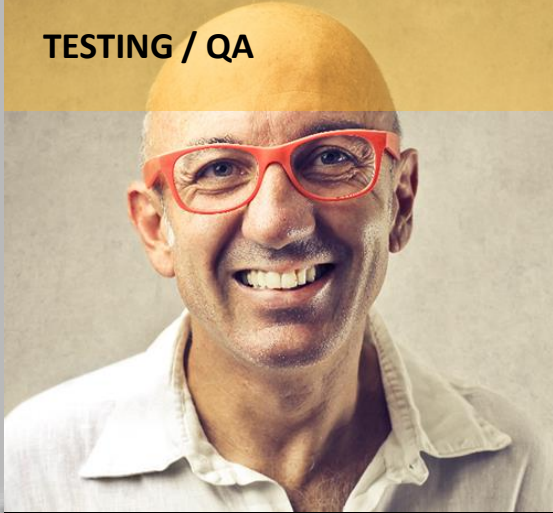
Vital materials IP is being lost because of poor information management and storage



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

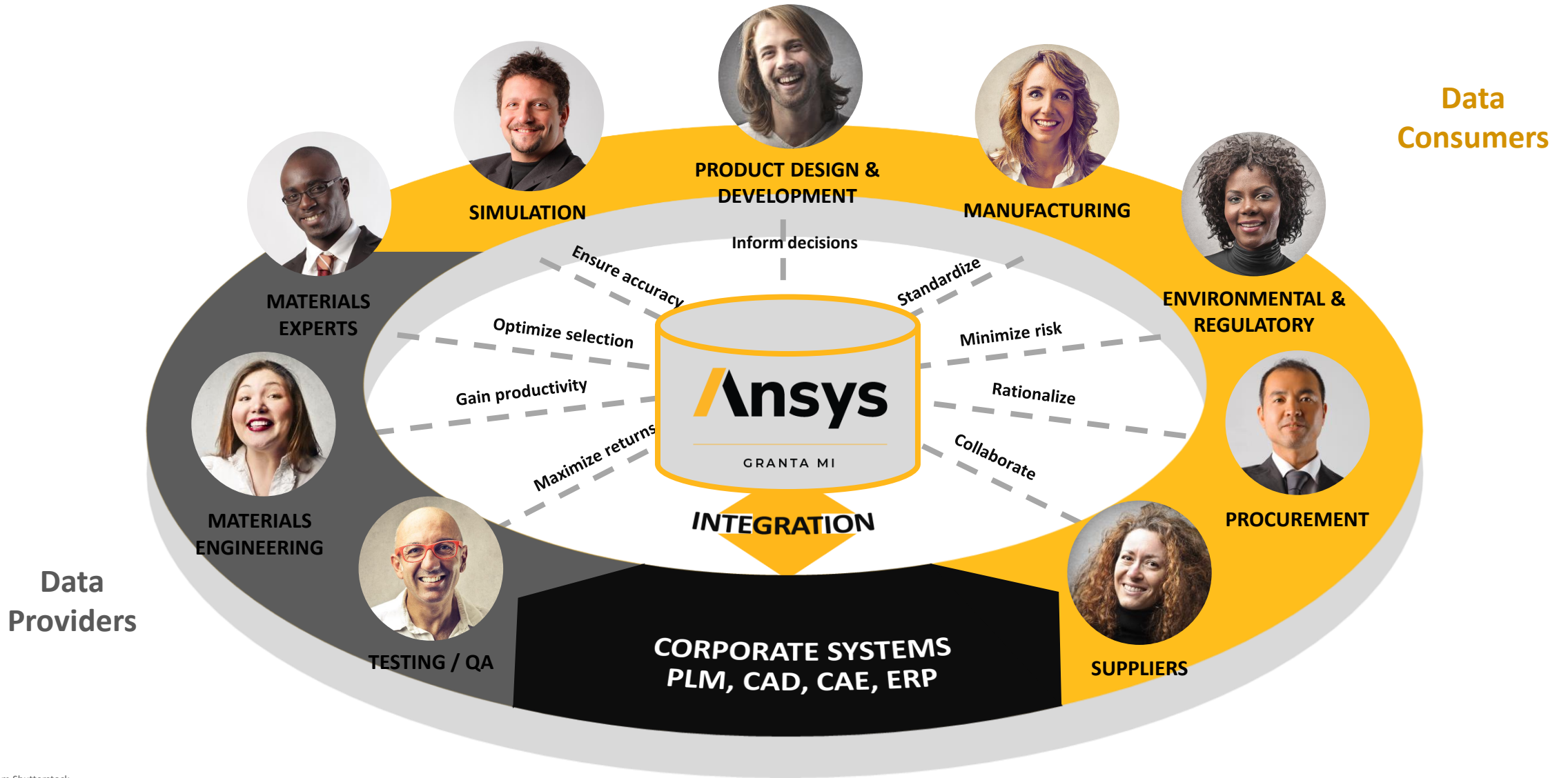
ENVIRONMENTAL & REGULATORY



“

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

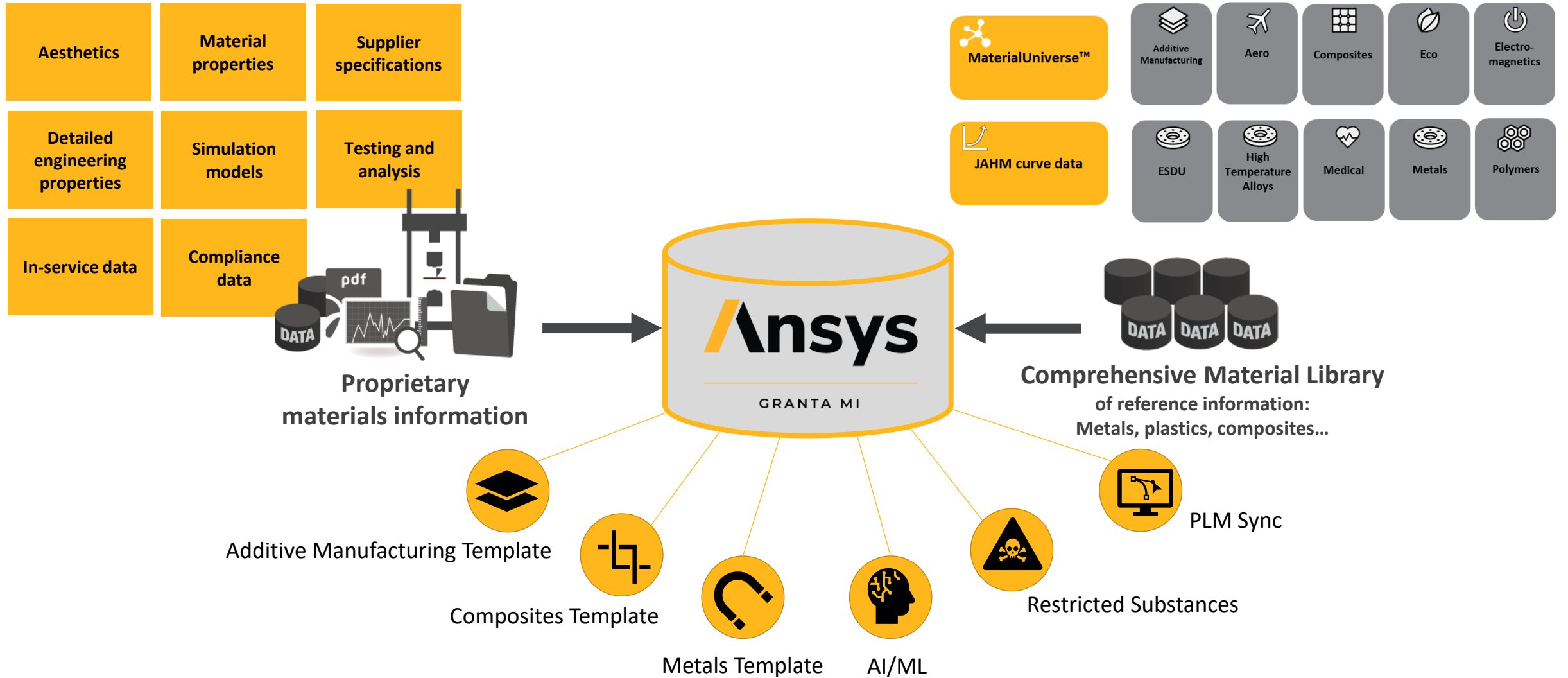
Granta MI – The Authoritative Source of Materials Data



Images: licensed from Shutterstock



All your material data in one place



An unrivalled library of materials property data

Core Materials Data

Included in Granta MI and Granta Selector



MaterialUniverse™



JAHM curve data

Advanced Materials Data

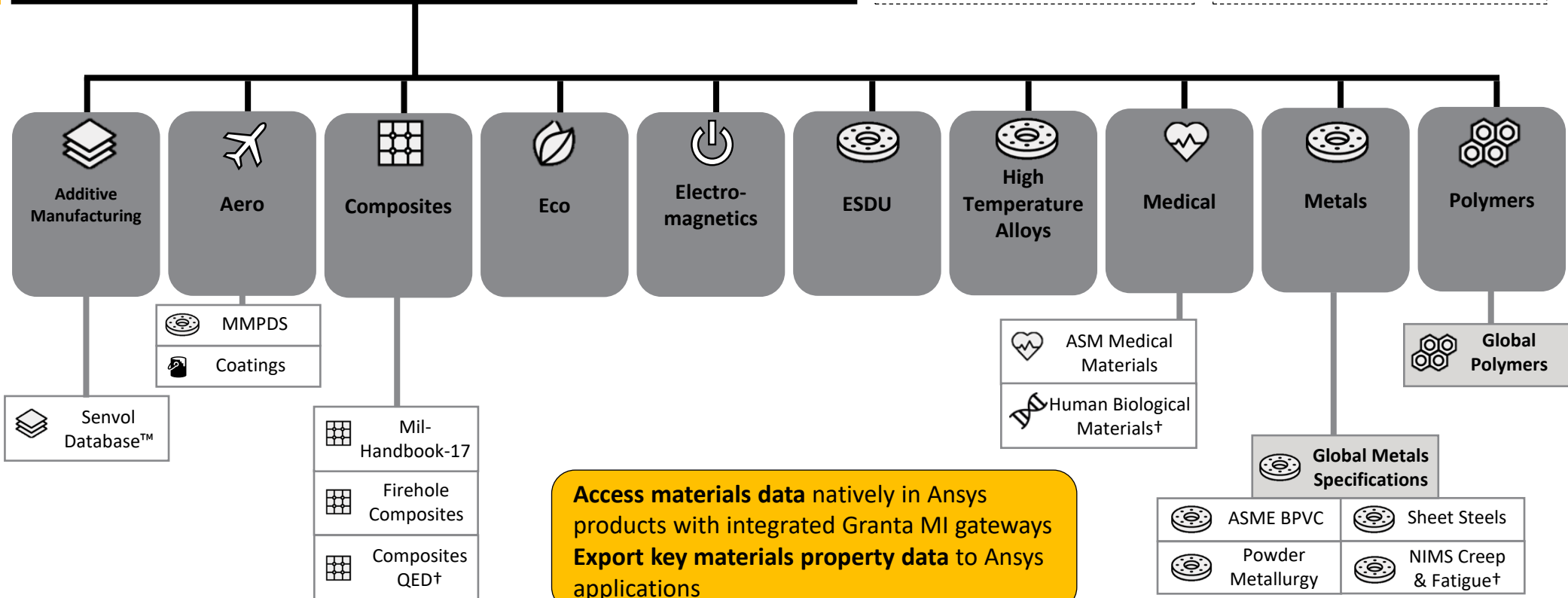
Purchased as collections for Granta MI and Granta Selector

Materials Data for Simulation

Simulation-ready data in Ansys flagship products

Restricted Substances†

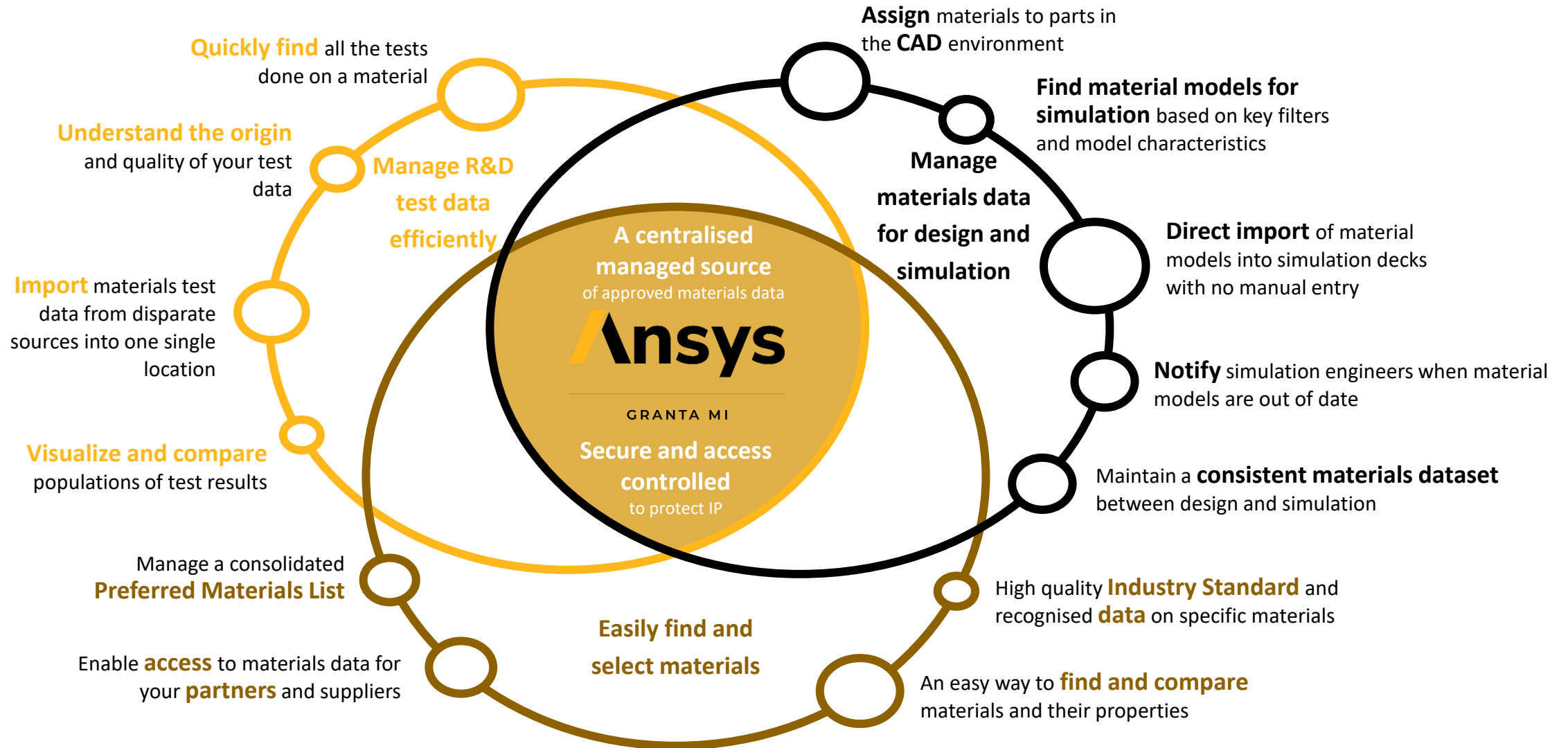
Best practices for managing critical chemicals and substances risks in MI



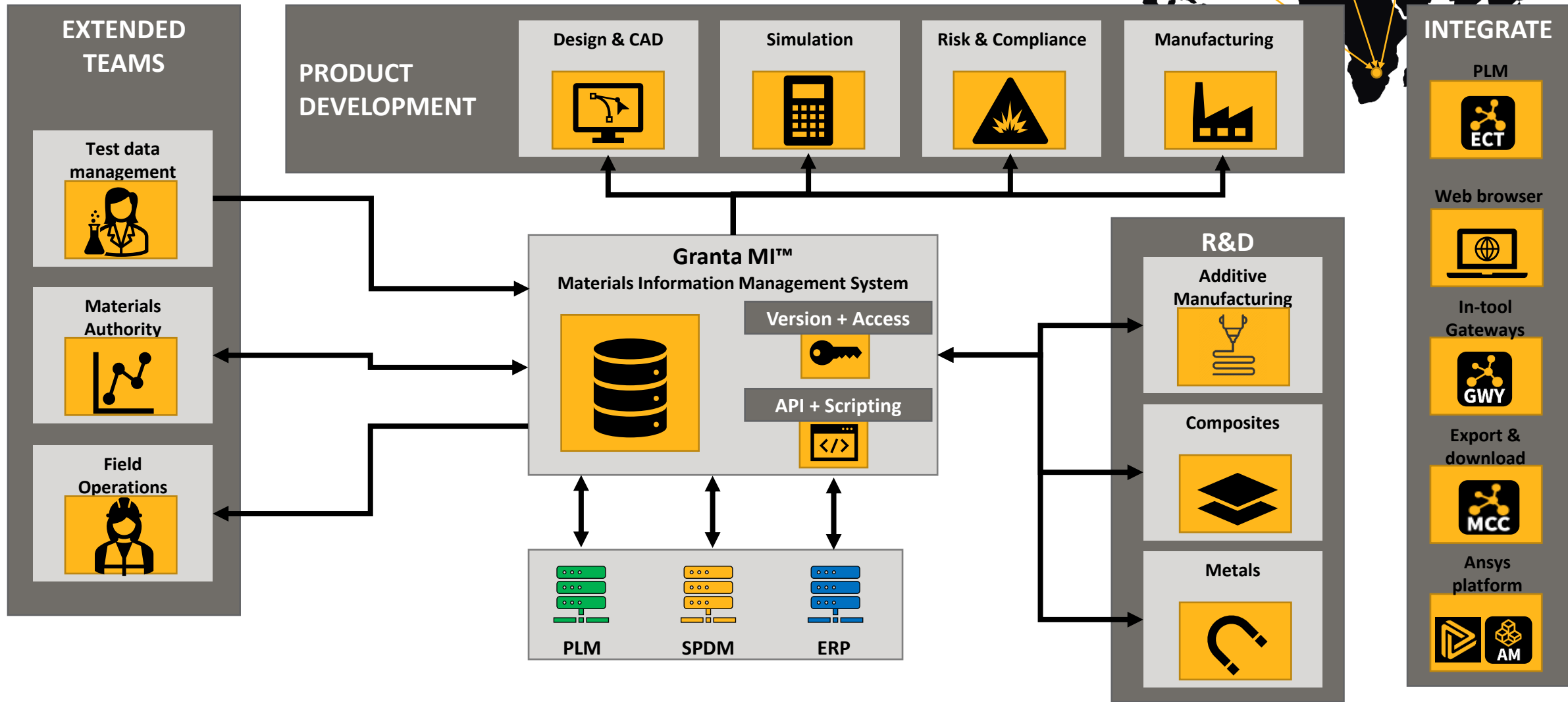
Access materials data natively in Ansys products with integrated Granta MI gateways
Export key materials property data to Ansys applications

† Granta MI Enterprise only

Key Use Cases Supported

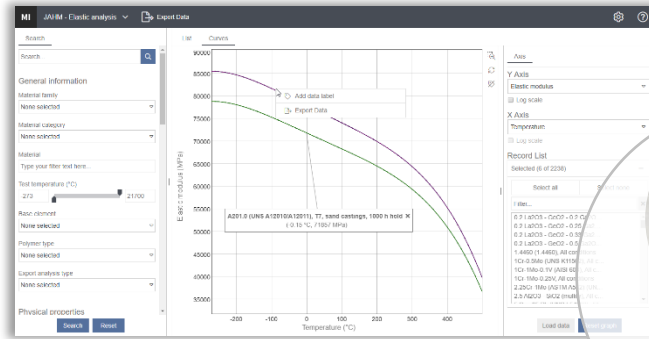


Enterprise-wide materials information



Making the user experience as easy as possible.

Based on a 'single view of the truth' for materials



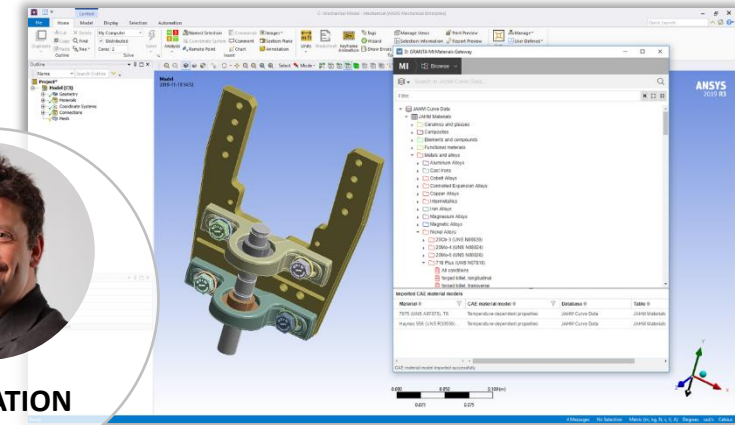
Analyze property data



MATERIALS ENGINEERING



SIMULATION



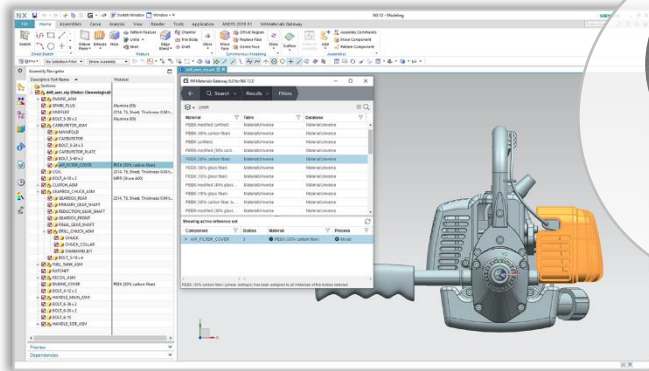
Integration with CAE



PRODUCT DESIGN



ENVIRONMENTAL & REGULATORY



Guided materials assignment in CAD/PLM

Name	Base #	Density (kg/m³)	Young's modulus (GPa)
250 managing steel, managed at 900°	Fe (iron)	7850 - 7960	183 - 192
ABS (20% carbon fiber, EMI shielding, conductive)	Polymer	1130 - 1142	12.4 - 13.8
ABS (20% glass fiber, injection molding)	Polymer	1150 - 1220	5.1 - 6.07
ABS (20% glass fiber, injection molding, flame retardant)	Polymer	1300 - 1380	5.8 - 6
ABS (20% glass fiber, injection molding)	Polymer	1280 - 1300	6.8 - 8.3
ABS (polyfused)	Polymer	1050 - 1080	2 - 2.5
ABS (transparent, injection molding)	Polymer	1070 - 1090	1.95 - 2.05
Alumino silicate - 1720	Oxide	2490 - 2540	84.8 - 89.1
Alumino silicate - 1723	Oxide	2910 - 2960	83.9 - 88.1
Aluminum, 7075, wrought, T6	Al (Aluminum)	2770 - 2830	69 - 76
Aluminum, 7075, wrought, T74	Al (Aluminum)	2780 - 2810	69 - 72.5
Bismuth silicate	Oxide	2730 - 2760	66.3 - 69.7
Leather	Other	810 - 1050	0.1 - 0.5
Lithium aluminosilicate	Oxide	2500 - 2600	84 - 86
Low alloy steel, AISI 4130, air melted, normalized	Fe (iron)	7750 - 7870	200 - 210
Low alloy steel, AISI 4130, air melted, quenched & tempered	Fe (iron)	7750 - 7870	200 - 210
PMMA (cast sheet)	Polymer	1150 - 1200	2.7 - 2.9
PMMA (heat resistant)	Polymer	1160 - 1220	2.41 - 3.8
PMMA (impact modified)	Polymer	1110 - 1160	1.6 - 3.5
PMMA (molding and extrusion)	Polymer	1170 - 1200	2.24 - 3.24
PVC-elastomer (Shore A35)	Polymer	1050 - 1120	0.00001 - 0.000038
PVC-elastomer (Shore A55)	Polymer	1120 - 1170	0.00005 - 0.00024
PVC-elastomer (Shore A75)	Polymer	1210 - 1250	0.00012 - 0.00117

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.

The image shows a screenshot of the Ansys Workbench software interface. On the left, the 'Outline of Schematic A3: Engineering Data' is visible, showing a table with columns A, B, C, and D. Row 3 is highlighted, showing 'Aluminum, 7075, T6'. Below this, the 'Properties of Outline Row 3: Aluminum, 7075, T6' are shown in a table with columns A (Property) and B (Value). Row 4 is highlighted, showing 'Isotropic Elasticity' with a 'Tabular' value. On the right, the 'Materials Gateway' window is open, displaying a search interface for 'Material Universe'. It shows a list of materials with columns for 'Material', 'Table', and 'Database'. A search bar at the top contains 'Search in MaterialUniverse...'. Below the search bar, there are filter icons for 'Material', 'Table', and 'Database'. The list includes materials like 'Low alloy steel, AISI 4135, air melted, quenched & tempered', 'Stainless steel, austenitic, AISI 301, annealed', etc. At the bottom of the Materials Gateway window, a status bar indicates 'CAE material model imported successfully'.



Assign materials directly in Ansys Electronics Desktop

Change notification

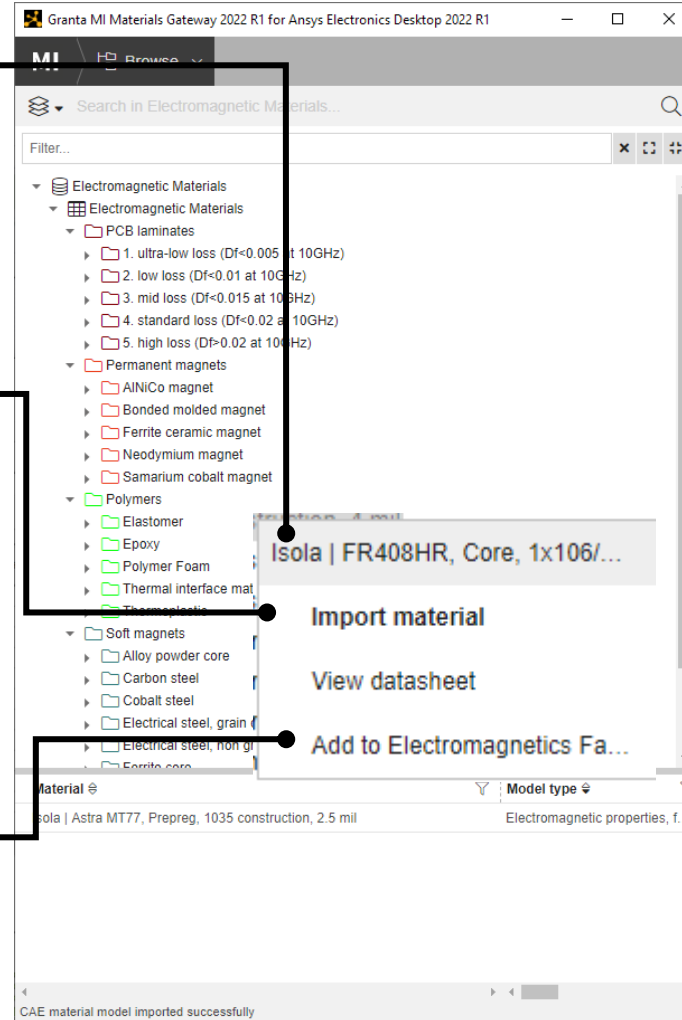
Get notified when the material data is updated.

Material models

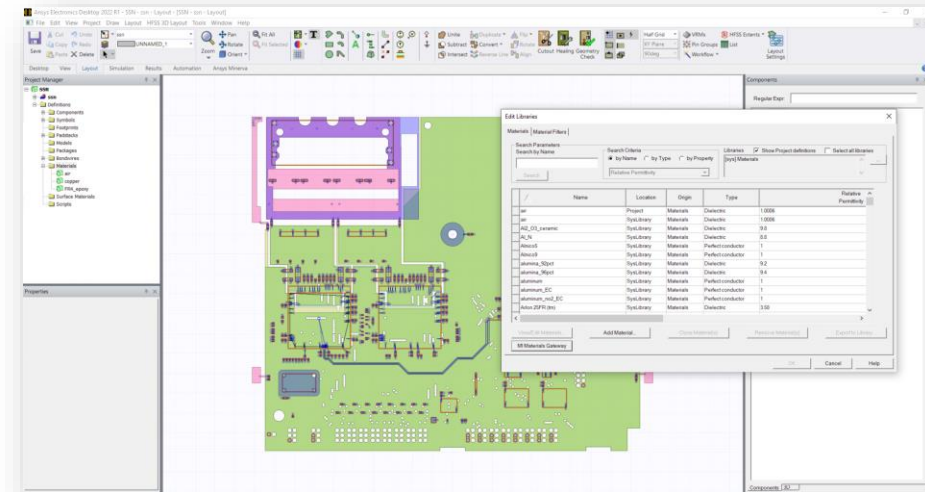
Find the right data models for simulation when and where required.

Favorites

Fast assignment from favorites list.



Guarantee the approved material is used every time



Integration with Ansys Discovery

SIMULATION



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

Component	Material
BOLT_5-18	PTC_SYSTEM_MTRL_PROPS
BOLT_5-28	PTC_SYSTEM_MTRL_PROPS
CRANK	
CRANKSHAFT	PTC_SYSTEM_MTRL_PROPS
FLYWHEEL	PP (copolymer, 30% glass fiber)
PISTON	
PISTON	PTC_SYSTEM_MTRL_PROPS
PISTON_PIN	PTC_SYSTEM_MTRL_PROPS
PISTON_RING	PTC_SYSTEM_MTRL_PROPS

PP (copolymer, 30% glass fiber) has been assigned to all instances of the selected part

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.

Granta MI Materials Gateway

MI Browse

Search in MaterialUniverse...

Filter...

- MaterialUniverse
 - MaterialUniverse
 - Ceramics and glasses
 - Glass ceramics
 - Glasses
 - Non-technical ceramics
 - Technical ceramics
 - Fibers and particulates
 - Hybrids: composites, foams, honeycombs, natural materials
 - Liquids and gases
 - Magnetic materials
 - Metals and alloys
 - Ferrous
 - Non-ferrous
 - Aluminum
 - Beryllium
 - Chromium
 - Cobalt
 - Copper
 - Lead
 - Manganese

Component	Count	Number	Version	Material	Table
Bearing Assembly					
baseplate_m prt		0000000...	A.3		
bearing_m prt		0000000...	A.5		
Branch2ComponententNoCAD		0000000...	A.5		
filled_assembly.asm		0000000...	A.1		
housing_m prt		0000000...	A.2		

Completed loading Bill of Materials

“ Guarantee the approved material is used every time ”

windchill wuser

Abstract Specificatio... Search ... Quick Links

Products > Watch

Part - 000000023, w3_m, A.19 (Design)

Details Structure Related Objects Changes History Where Used Granta Assignments

Visualization and Attributes | More Attributes

Visualization and Attributes

Name: w3_m
Status: Working copy, checked-out to you (Go to Original Version)
Modified By: wuser
Last Modified: 2021-05-21 11:05 BST

General

Assembly	Component	End Item:	No
Model:	Make	Default Unit:	each
Source:	No	Default Trace Code:	Untraced
Gathering Part:	No		

Type Attributes

GRANTA_CLR_DATABASE_KEY_CAD:
GRANTA_CLR_DATABASE_KEY_PLM:
GRANTA_CLR_EXPORT_DATETIME_CAD:
GRANTA_CLR_EXPORT_DATETIME_PLM:
GRANTA_CLR_IDENTITY_GUID_CAD:
GRANTA_CLR_IDENTITY_GUID_PLM:
GRANTA_CLR_NAME_CAD:
GRANTA_CLR_NAME_PLM:
GRANTA_CLR_VERSION_GUID_CAD:
GRANTA_CLR_VERSION_GUID_PLM:
GRANTA_DATABASE_KEY_CAD:
GRANTA_DATABASE_KEY_PLM:
GRANTA_DENSITY:
GRANTA_EXPORT_DATETIME_CAD:
GRANTA_EXPORT_DATETIME_PLM:
GRANTA_IDENTITY_GUID_CAD:
GRANTA_IDENTITY_GUID_PLM:
GRANTA_PRC_DATABASE_KEY_CAD:
GRANTA_PRC_DATABASE_KEY_PLM:
GRANTA_PRC_EXPORT_DATETIME_CAD:
GRANTA_PRC_EXPORT_DATETIME_PLM:
GRANTA_PRC_IDENTITY_GUID_CAD:
GRANTA_PRC_IDENTITY_GUID_PLM:





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]]]
```

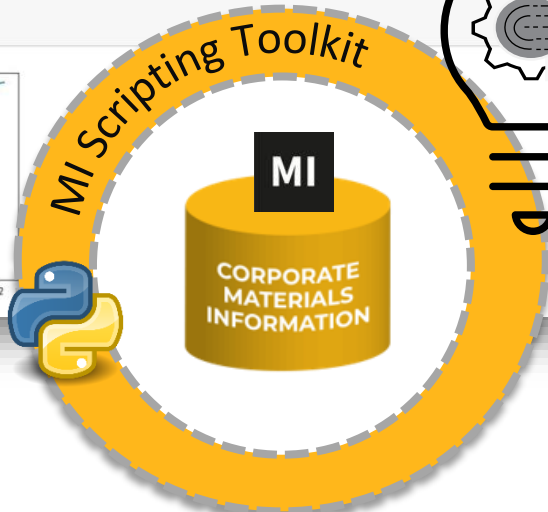
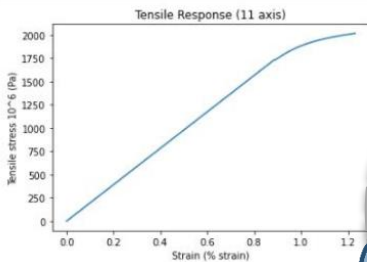
Plot the curves using the matplotlib package.

```
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

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


 MI Materials Gateway

   Platform integration

 Python Scripting Toolkit

 MI Material Card Connect (PLM Sync)

 MI Enterprise Connect (PLM Sync)

 File exporter

Designing for Proactive Sustainability

Objective

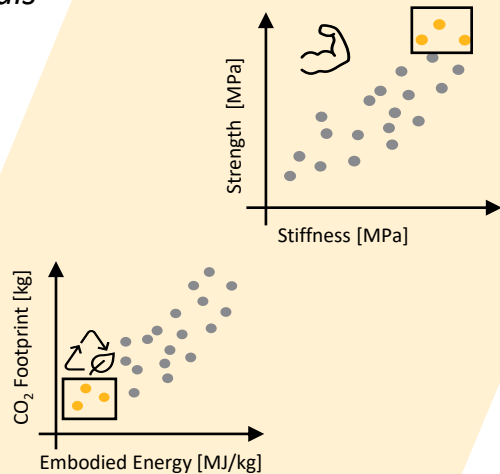


UN Sustainable Development Goals



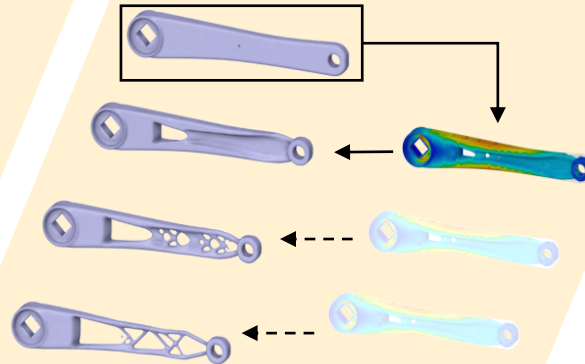
Materials Selection

Using: Granta Selector



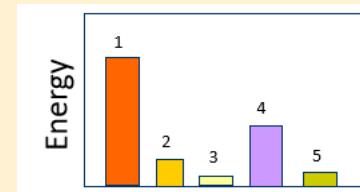
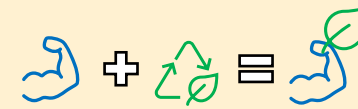
Validation & Design Optimization

Using: Ansys Discovery

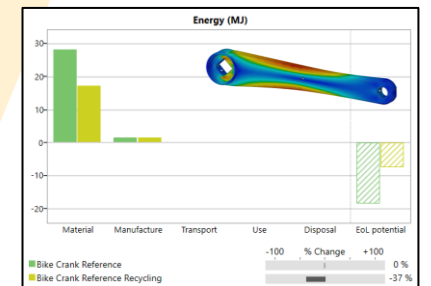


Concept Assessment

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.

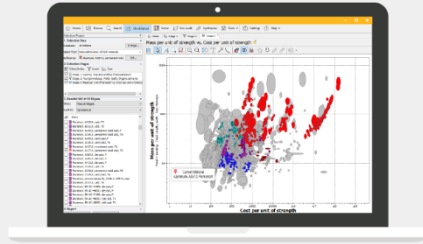


Granta MDS

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

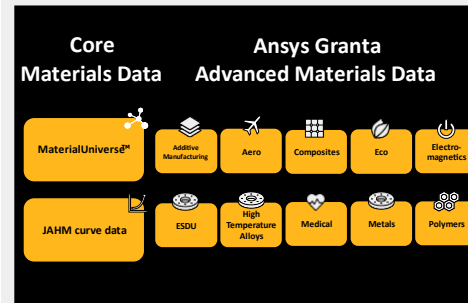


Granta Selector

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

Solves:

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

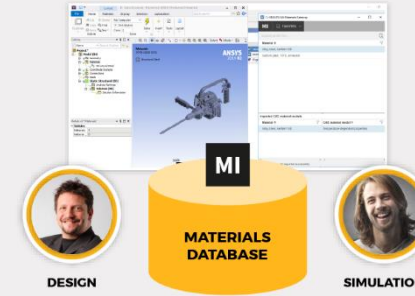


Material Data

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

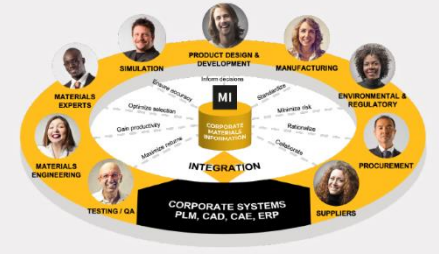


Granta MI Pro

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



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