



MATERIALS KNOWLEDGE MANAGEMENT

– FOR ENGINEERING, COST, AND SUSTAINABILITY –
FOR PTC CREO AND PTC WINDCHILL

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Product Director, Materials Strategy & PLM Integration

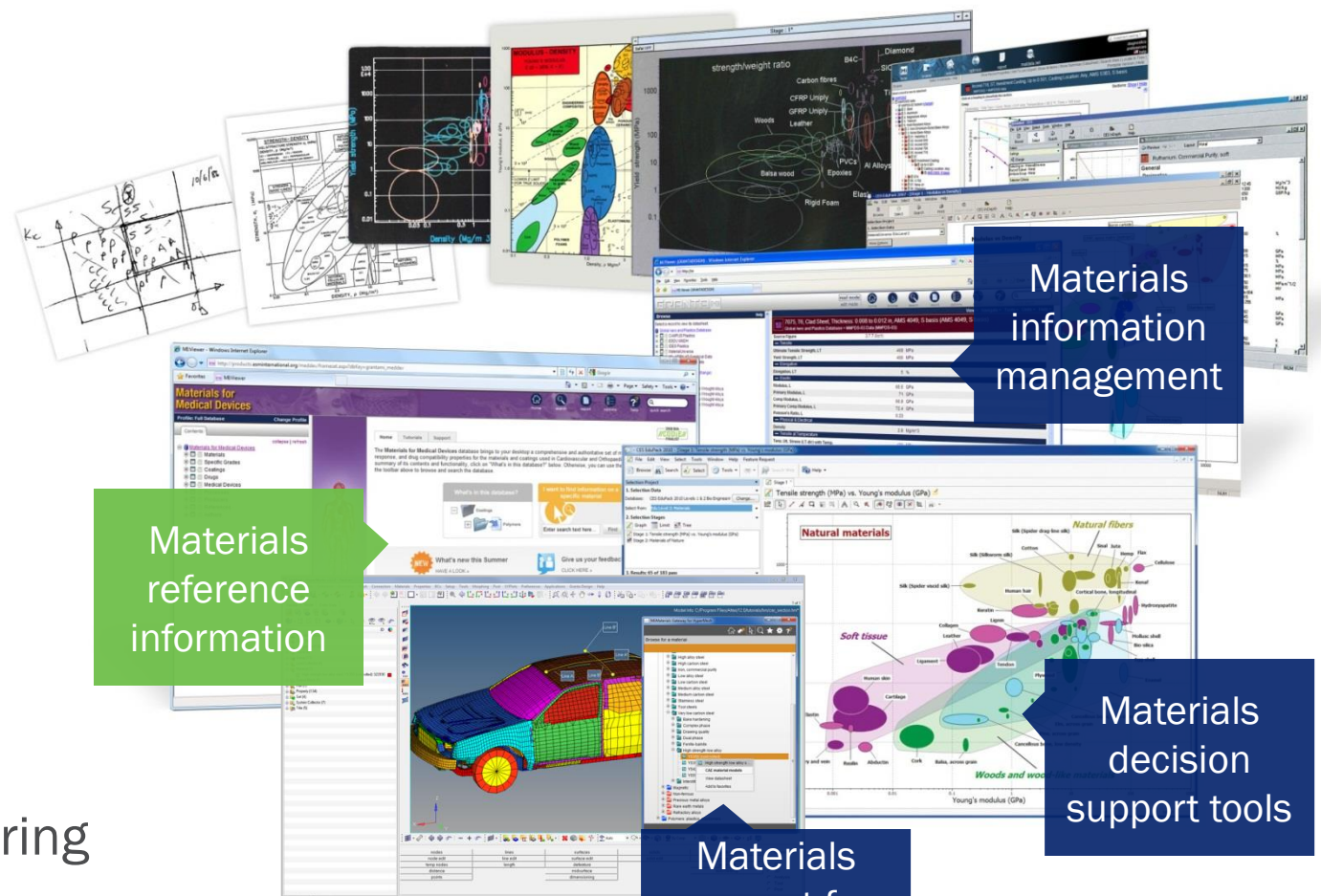
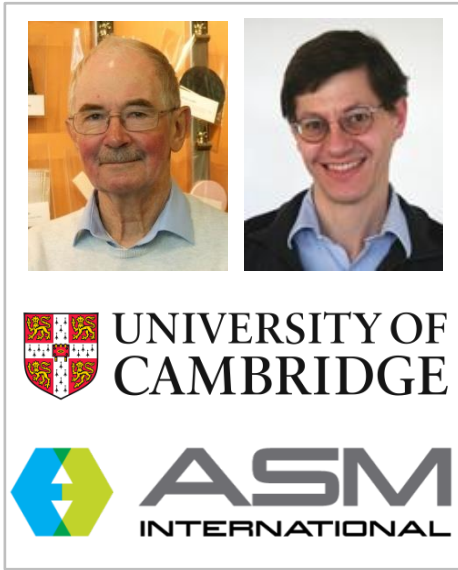
Tuesday, June 7

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- Brief introduction to Granta Design
- Typical materials challenges
- Materials applications for Creo and Windchill
- Summary

GRANTA DESIGN—INNOVATING SINCE 1994



Software +

Information

...related to engineering materials and their properties

Materials reference information

Materials information management

Materials decision support tools

Materials support for CAD, CAE, PLM

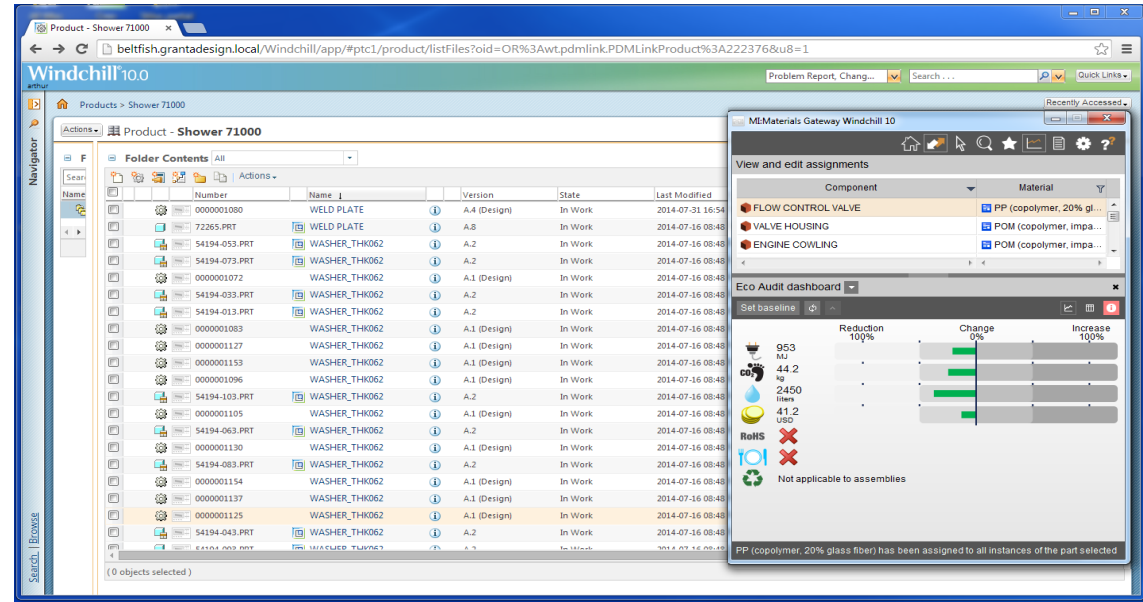
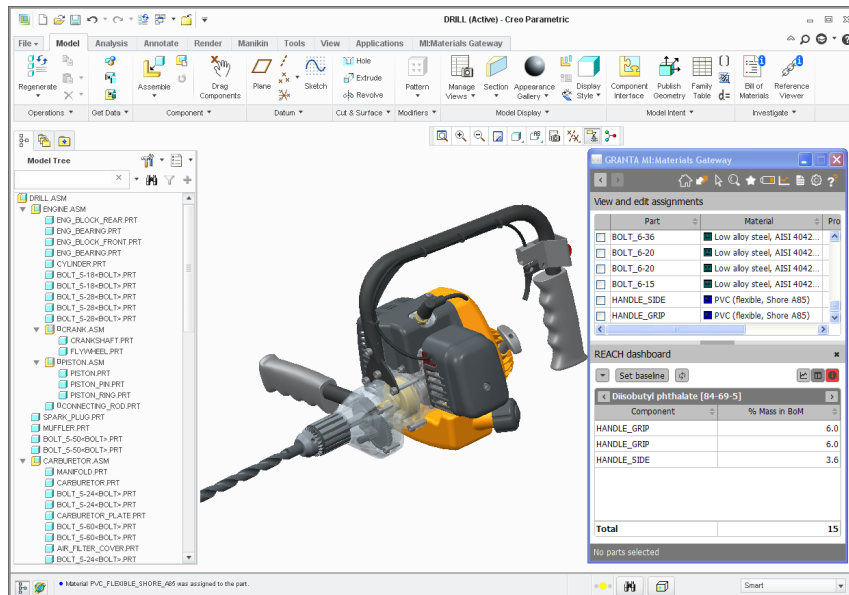
OUR PARTNERS AND COLLABORATIONS



	Owners				
		UNIVERSITY OF CAMBRIDGE		ASM INTERNATIONAL	
Data		ASME SETTING THE STANDARD		CAMPUS	
		MMPDS		IHS	
		NCAMP		Stahl	
		NIMS		UL	MI-21 Metals Information For the 21st Century
Collaborations		ADS		Stahl	Computation
		AMAZE		Stahl	
		Periodic table		ELLEN MACARTHUR FOUNDATION THE CIRCULAR ECONOMY ©100	Education
		SEFI		SEFI	
		FEMS			



- Gold member of PTC's Partner Advantage Program since 2007



OUR CUSTOMERS: MANUFACTURERS WORLDWIDE



Consortia

- **Material Data Management Consortium**
- **EMIT Consortium**
- **AutoMatic**





- Airbus
- Airbus Helicopters ● ●
- Airbus Defence & Space ●
- AWE ●
- ASCO Industries
- Baker Hughes ●
- Boeing ● ●
- Bombardier Aerospace
- Bosch
- Constellium

- DePuy
- Donaldson
- Doosan Babcock ●
- Embraer ●
- Emerson Electric ●
- ESA
- Ethicon Surgical Care
- GE ●
- General Motors ●
- GKN Aerospace ●

- Honeywell ● ● ●
- Huntsman
- Hutchinson
- IHI
- Jaguar Land Rover ●
- KSPG ●
- Lab 126 (Kindle)
- LL Products
- Lockheed Martin ●
- MASCO
- MBDA Group
- MTU
- NASA ●
- Northrop Grumman ●
- Novo Nordisk
- NPL ●
- Philips Technologie

- Parker Aerospace
- Perkins Engines
- Pratt & Whitney ●
- PSA Peugeot Citroën ●
- Raytheon ●
- Rheinmetall (KSPG Auto)
- Rhodia
- Rolls-Royce ● ●
- RUAG Space
- Suzlon
- Sulzer ●
- Thales ●
- Thyssen Krupp Steels
- TRW Automotive
- United Technologies Corp ● ●
- Vestas

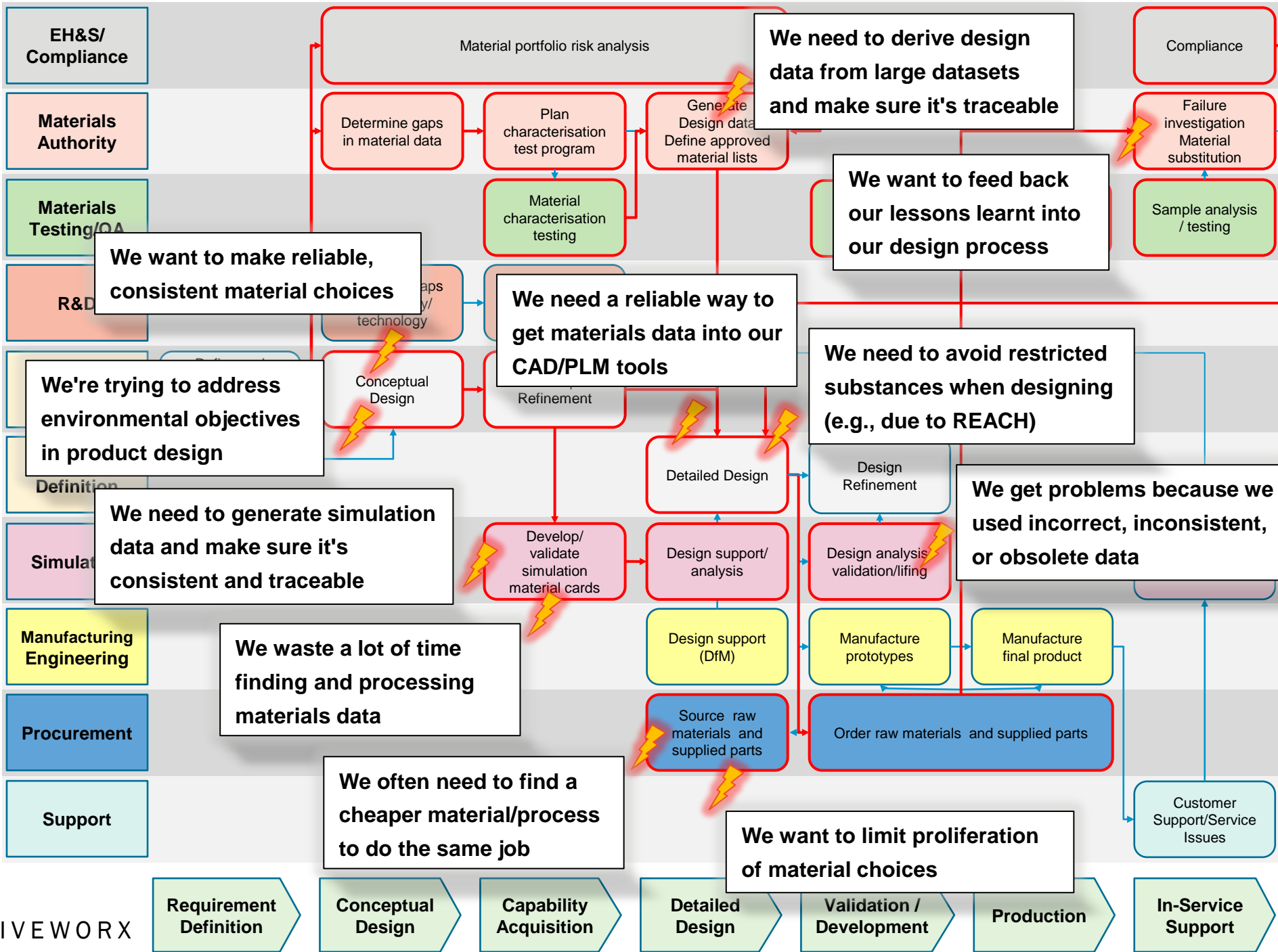


THE TYPICAL MATERIALS KNOWLEDGE ENVIRONMENT

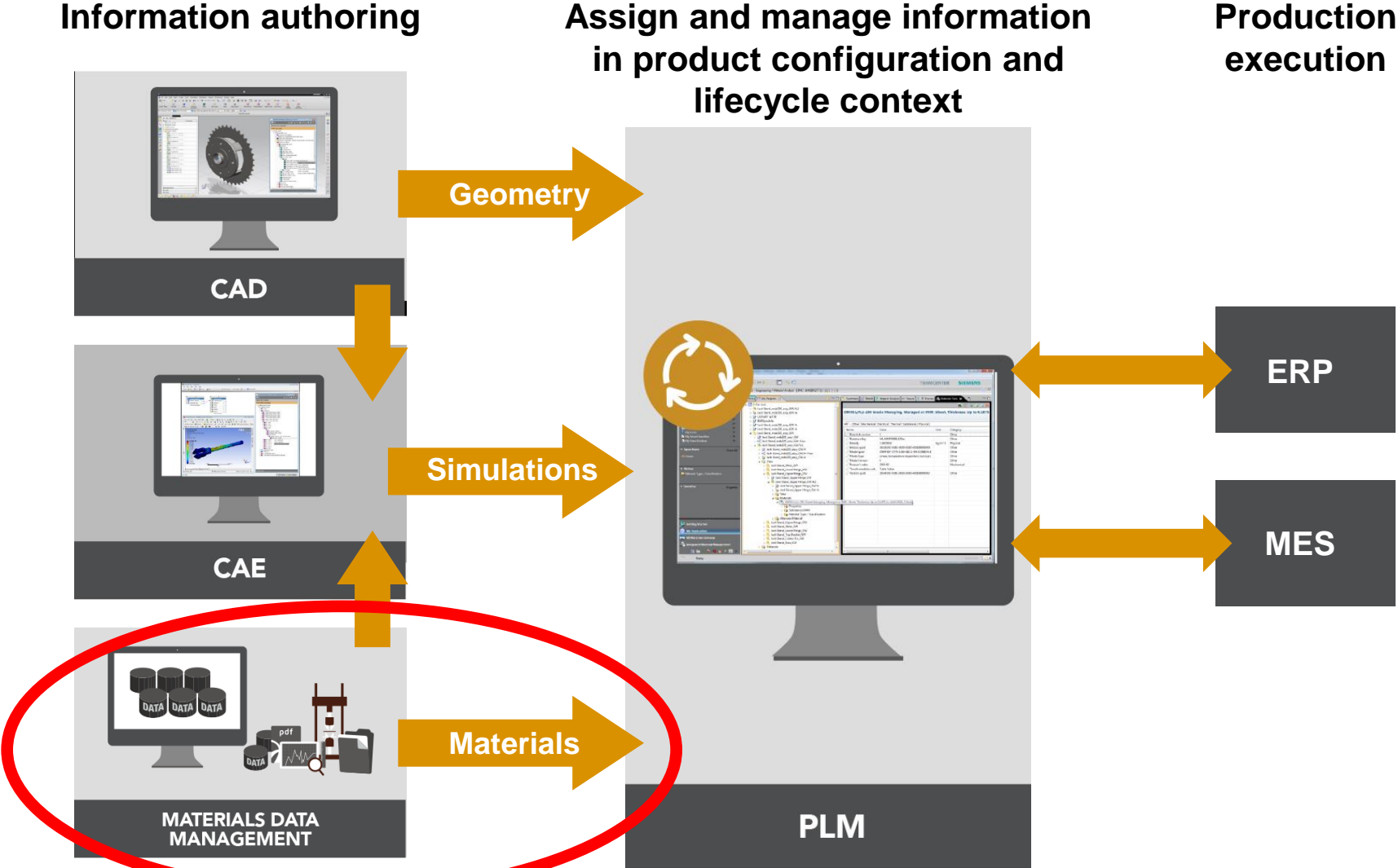
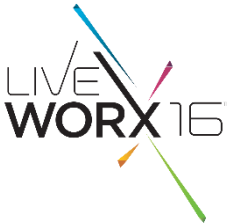


- Data scattered in spreadsheets, databases, hard copy, file systems...
- Islands of information
- No systematic access control, security, versioning

AND TYPICAL MATERIALS CHALLENGES

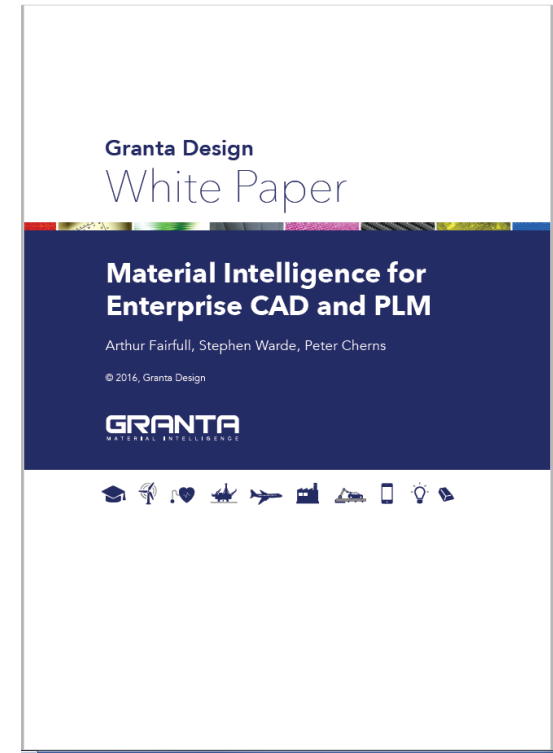


MATERIALS INFORMATION AUTHORIZING IN PLM CONTEXT



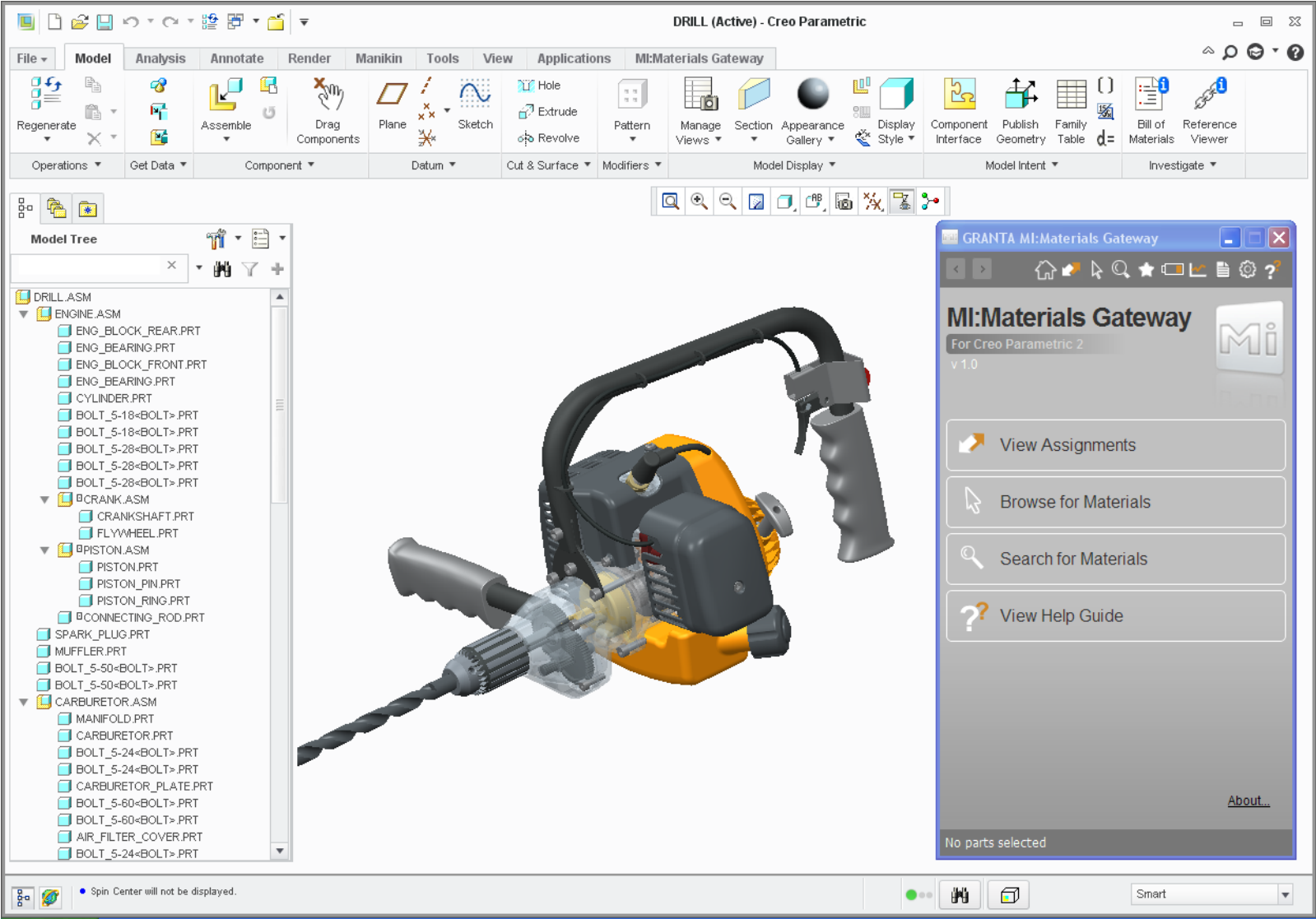
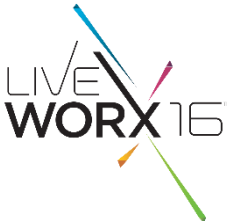
CATEGORIES OF VALUE

1. Derivation of approved, traceable, materials information subset published for enterprise-wide use
2. Assignment of relevant materials from that subset to the design or product structure, building out the engineering bills of materials (EBoMs)
3. Analytics and reporting on these assignments, enabling design optimization and risk avoidance re cost, weight, legislation, ... implications



Materials
authoring

GRANTA MI: MATERIALS GATEWAY FOR CREO



OPTIONS FOR EACH MATERIAL



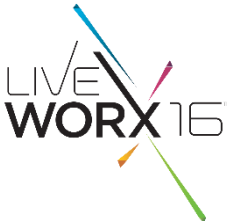
ASSIGNING MATERIAL TO A PART

All in-house design engineers and suppliers have access to a single, consistent list of company material specifications and selection rules, to select and assign in CAD

Part	Material
<input type="checkbox"/> PISTON_PIN	
<input type="checkbox"/> PISTON_RING	
<input type="checkbox"/> CONNECTING_ROD	
<input type="checkbox"/> SPARK_PLUG	
<input type="checkbox"/> MUFFLER	
<input type="checkbox"/> BOLT_5-50	
<input type="checkbox"/> BOLT_5-50	
<input type="checkbox"/> FOLD	
<input checked="" type="checkbox"/> CARBURETOR	Aluminum, A356.0, cast, T6
<input type="checkbox"/> BOLT_5-24	
<input type="checkbox"/> BOLT_5-24	
<input type="checkbox"/> CARBURETOR_PLATE	
<input type="checkbox"/> BOLT_5-60	
<input type="checkbox"/> BOLT_5-60	
<input type="checkbox"/> AIR_FILTER_COVER	
<input type="checkbox"/> BOLT_5-24	
<input type="checkbox"/> COIL	
<input type="checkbox"/> BOLT_4-18	
<input type="checkbox"/> BOLT_4-18	

Aluminum, A356.0, cast, T6 is assigned to the selected part

RESULTING PROPERTIES IN CREO MODEL



The screenshot displays the Creo Parametric software interface. The main window shows a 3D model of a cylinder. The Model Tree on the left lists the following features: CYLINDER.PRT, RIGHT, TOP, FRONT, PRT_CSYS_DEF, Copy Geometry id 39, Protrusion id 101, Protrusion id 121, Group BORE_PORT_1, Group BORE_PORT_2, FINS, FIN_CUTS, Pattern (Round), Group TOP_PROT, Cut id 2905, Cut id 2684, BASE_ROUND, INTAKE_PORT, EXH_PORT, Group COIL_BOSSSES, BORE, SP_PLUG_HOLE, INTAKE_CUT, EXH_CUT, Draft id 10793, Draft id 10838, Cut id 4073, Cut id 4132, Protrusion id 4027, Draft id 4399, TOP_FIN_CUT, Round id 8062, Round id 8244, Round id 10937, DTM21, and EXH_CLEARANCE.

The Material Definition dialog box is open, showing the following properties:

- Name: A3560_T6_CASTING_CASTING_LO
- Description: A3560, T6, Casting, Casting Location: Nondesigned, Casting Class: 11, AMS
- Density: 2.68495e-09 tonne/mm^3
- Symmetry: Isotropic
- Stress-Strain Response: Linear
- Poisson's Ratio: 0.33
- Young's Modulus: 71.7 GPa
- Coeff. of Thermal Expansion: 0.0000207 /C
- Mechanisms Damping: sec/mm
- Material Limits:
 - Tensile Yield Stress: 186 MPa
 - Tensile Ultimate Stress: 228 MPa
 - Compressive Ultimate Stress: MPa
- Failure Criterion: None
- Fatigue: None

TRACEABILITY – “PEDIGREE” ATTRIBUTES



The screenshot displays the Creo Parametric software interface for a part named "CYLINDER (Active)". The main window shows the Model Tree on the left, the ribbon menu at the top, and the main workspace. Two windows are open in the foreground:

- Material Definition Dialog:** This dialog is for defining the material "A356.0_T6_CASTING_CASTING_LO". It shows the name, description, and density (2.68495e-09 tonne/mm^3). The "User Defined" tab is active, showing a table of properties:

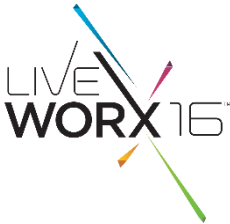
Name	Type	Value
GRANTA_DATABASE_NAME	String	Aerospace Materials Database
GRANTA_VWINDOWS_USER	String	ELPIS\Administrator
GRANTA_EXPORT_DATETIME	String	Time of export: 2013-06-08T01:08:16
GRANTA_MODEL_TYPE	String	Default
GRANTA_DATALINK_VERSION	Integer	3
GRANTA_DATABASE_KEY	String	3:MI_Aero
GRANTA_SERVICE_URL	String	3:http://elpis/mi_servicelayer/GatewayOptio...
GRANTA_IDENTITY_GUID	String	3:CFC7277B-8467-4202-82F0-1445E0C202...
GRANTA_VERSION_GUID	String	3:00000ED4-000E-4FFF-8FFF-B5E2FFFF0000
GRANTA_MODEL_REFERENCE	String	3:FCD55AB-00CD-3424-BF42-AA32FD14400

- GRANTA MI:Materials Gateway Window:** This window shows the "View and edit assignments" for the material. It displays a table with columns for Part and Material:

Part	Material
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

The table shows that the material "A356.0, T6, Casting, Casting Location: Nondesigned, Casting Class: 11, AMS-A-2" is assigned to the part "CYLINDER".

DASHBOARD HIGHLIGHTING ECO IMPLICATIONS



The screenshot displays the GRANTA MI:Materials Gateway interface. On the left is the Model Tree, showing a hierarchical structure of parts including DRILL.ASM, ENGINE.ASM, BCRANK.ASM, BPISTON.ASM, and CARBURETOR.ASM. The central 3D model shows a yellow and black cordless drill. On the right, the 'GRANTA MI:Materials Gateway' window is open, displaying a table of 'View and edit assignments' and an 'Eco Audit dashboard'.

View and edit assignments

Part	Material	Process
ENG_BLOCK_R...	Aluminum, 356...	Casting
ENG_BEARING	Stainless steel,...	Forging / rolling
ENG_BLOCK_FR...	Aluminum, 356...	Casting
ENG_BEARING	Stainless steel,...	Forging / rolling
CYLINDER...	Aluminum, 356...	Casting
BOLT_5-18	Low alloy steel...	Forging / rolling

Eco Audit dashboard

CO₂ footprint (kg)

Component	T...	Mat...	M...	Tr...	Use	End...
Static Use	0.0	N/A	N/A	N/A	0.0	N/A
CYLINDER	0.69	3.1	0.17	0.0	0.0	-2.6
ENG_BLOCK...	0.49	2.2	0.12	0.0	0.0	-1.8
ENG_BLOCK...	0.46	2.0	0.12	0.0	0.0	-1.7
ENG_BEARING	0.035	0.11	0.0...	0.0	0.0	-0.080
ENG_BEARING	0.035	0.11	0.0	0.0	0.0	-0.080
Total	1.8	7.6	0.45	0.0	0.0	-6.3

Material LOW_ALLOY_STEEL_AISI_4042_TEM was assigned to the part.

DASHBOARD HIGHLIGHTING REACH IMPLICATIONS



The screenshot displays the GRANTA MI:Materials Gateway interface. On the left, the Model Tree lists the components of the DRILL.ASM assembly, including sub-assemblies like ENGINE.ASM, BCRANK.ASM, BPISTON.ASM, and CARBURETOR.ASM. The central 3D model shows a yellow and black power drill with a grey handle and a black drill bit. On the right, the GRANTA MI:Materials Gateway window is open, showing a table of material assignments and a REACH dashboard for Diisobutyl phthalate [84-69-5].

GRANTA MI:Materials Gateway - View and edit assignments

Part	Material	Pro
<input type="checkbox"/> BOLT_6-36	Low alloy steel, AISI 4042...	
<input type="checkbox"/> BOLT_6-20	Low alloy steel, AISI 4042...	
<input type="checkbox"/> BOLT_6-20	Low alloy steel, AISI 4042...	
<input type="checkbox"/> BOLT_6-15	Low alloy steel, AISI 4042...	
<input type="checkbox"/> HANDLE_SIDE	PVC (flexible, Shore A85)	
<input type="checkbox"/> HANDLE_GRIP	PVC (flexible, Shore A85)	

REACH dashboard

Set baseline

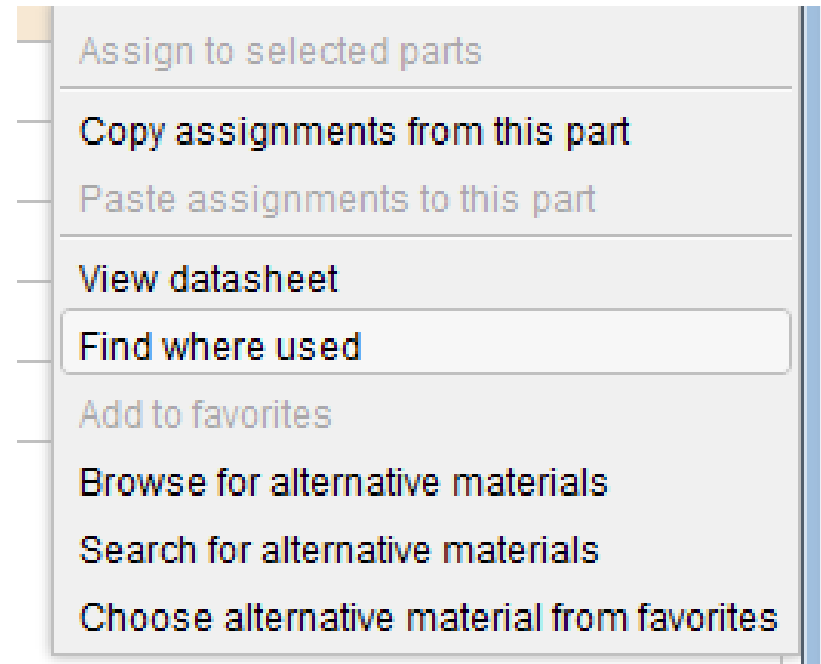
Diisobutyl phthalate [84-69-5]

Component	% Mass in BoM
HANDLE_GRIP	6.0
HANDLE_GRIP	6.0
HANDLE_SIDE	3.6
Total	15

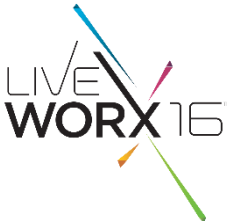
No parts selected

Material PVC_FLEXIBLE_SHORE_A85 was assigned to the part.

- Analogous functionality to Creo Gateway, in formal managed, product-revisioned Windchill environment
- ‘Low footprint’ materials assignment in product structure, always with ‘live link’ back to in-depth materials knowledge
- Insight from analytics tools early in product design
- Where used? Risk assessment across multiple products
 - Just what is the extent of that materials problem?



GRANTA MI: MATERIALS GATEWAY FOR WINDCHILL



The screenshot shows the Windchill 10.0 interface. The main window displays a list of parts for 'Product - Shower 71000'. A red box highlights three rows in the parts list:

Number	Name	Version	State	Last Modified
0000001080	WELD PLATE	A.4 (Design)	In Work	2014-07-31 16:54
72265.PRT	WELD PLATE	A.8	In Work	2014-07-16 08:48
54194-053.PRT	WASHER_THK062	A.2	In Work	2014-07-16 08:48

An 'MI:Materials Gateway Windchill 10' window is overlaid on the right, showing a table of material assignments:

Component	Material
FLOW CONTROL VALVE	POM (copolymer, impac...
VALVE HOUSING	POM (copolymer, impac...
ENGINE COWLING	POM (copolymer, impac...
FRONT HOUSING	POM (copolymer, impac...
HALO FACE PLATE - 2ND SHOT	Silicone (VMQ, heat cur...
WELD PLATE	PC (copolymer, high-heat)
REAR HOUSING	POM (copolymer, impac...
LINKAGE	Stainless steel, austeni...
ENGINE HOUSING	PP (copolymer, 20% gl...
DIVERGENCE CONE	Silicone (VMQ, heat cur...
END CAP	PP (copolymer, 20% gl...

A yellow callout box with a black border contains the text: 'Material assignments made to parts either earlier in CAD Gateway, or directly here in PLM Gateway'. An arrow points from this box to the 'WELD PLATE' row in the materials gateway table.

MATERIAL DATA LINKS FROM REVISIONED OBJECTS



Part - 000001080, WELD PLATE, A.4 (Design)

Visualization and Attributes | More Attributes

Granta Windchill Material Link

GRANTA_DATABASE_KEY_WC:	MI_Eco_Audit	GRANTA_SERVICE_URL_WC:	http://mi-demo-vpc64/mi_servicelayer/GatewayOptions.svc
GRANTA_DATALINK_VERSION_WC:	4	GRANTA_DATABASE_NAME_WC:	Eco Audit
GRANTA_IDENTITY_GUID_WC:	1D36ACD6-8629-4D0A-B8F1-5DFB8893B7B4	GRANTA_TXT_MTL_NAME_WC:	PC (copolymer, high-heat)
GRANTA_VERSION_GUID_WC:	63CADEC6-AE69-44CC-9468-14A0F9ACEEF4	GRANTA_TXT_CAE_NAME_WC:	Default CAD Attributes
GRANTA_MODEL_REFERENCE_WC:	00000000-0000-0000-0000-000000000000	GRANTA_MODEL_TYPE_WC:	Default
GRANTA_EXPORT_DATETIME_WC:	Time of export: 2014-07-31T15:54.37		
GRANTA_WINDOWS_USER_WC:	MI-DEMO-VPC64\LocAdmin		

Granta Creo Material Link

GRANTA_DATABASE_KEY_CREO:	MI_Eco_Audit	GRANTA_SERVICE_URL_CREO:	http://mi-demo-vpc64/mi_servicelayer/GatewayOptions.svc
GRANTA_DATALINK_VERSION_CREO:	4	GRANTA_DATABASE_NAME_CREO:	Eco Audit
GRANTA_IDENTITY_GUID_CREO:	6ECA2674-B6F0-4E73-BAA4-6D81BC56719F	GRANTA_TXT_MTL_NAME_CREO:	POM (copolymer, impact modified)
GRANTA_VERSION_GUID_CREO:	E4B9BF55-F9AD-47C8-BECB-D259FE8660EE	GRANTA_TXT_CAE_NAME_CREO:	Default CAD Attributes
GRANTA_MODEL_REFERENCE_CREO:	00000000-0000-0000-0000-000000000000	GRANTA_MODEL_TYPE_CREO:	Default
GRANTA_EXPORT_DATETIME_CREO:	Time of export: 2014-07-02T14:36.56	PRO_MP_AREA:	1.7684485711188E-3 m**2
GRANTA_WINDOWS_USER_CREO:	MI-DEMO-VPC64\LocAdmin	PRO_MP_VOLUME:	1.6244806563993E-6 m**3

System

Shower 71000

template:

By: Fairfull, Arthur

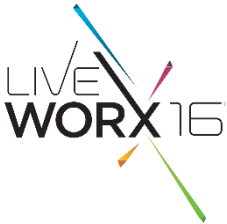
ified: 2014-07-31 16:54 BST

PLM user (a manager?) has over-ridden with preferred material

Most recent material assigned in CAD

CAD link provides access to geometry information, enabling Gateway analytics...

GATEWAY DASHBOARD DRIVEN FROM PLM



The screenshot displays the Windchill 10.0 interface for a product named 'Shower 71000'. The main area shows a 'Folder Contents' table with columns for Name, Number, Version, State, and Last Modified. The table lists various parts, including 'WELD PLATE' and 'WASHER_THK062' in different states and versions.

An overlay window titled 'MI:Materials Gateway Windchill 10' is open, showing 'View and edit assignments' for components like 'FLOW CONTROL VALVE', 'VALVE HOUSING', and 'ENGINE COWLING'. Below this is an 'Eco Audit dashboard' with a bar chart showing environmental metrics: 953 MJ, 44.2 kg CO2, 2450 liters, and 41.2 USD. The dashboard also indicates RoHS compliance status (marked with red X's) and a note that 'PP (copolymer, 20% glass fiber) has been assigned to all instances of the part selected'.

Name	Number	Version	State	Last Modified
WELD PLATE	0000001080	A.4 (Design)	In Work	2014-07-31 16:54
WELD PLATE	72265.PRT	A.8	In Work	2014-07-16 08:48
WASHER_THK062	54194-053.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	54194-073.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	0000001072	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	54194-033.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	54194-013.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	0000001083	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	0000001127	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	0000001153	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	0000001096	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	54194-103.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	0000001105	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	54194-063.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	0000001130	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	54194-083.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	0000001154	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	0000001137	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	0000001125	A.1 (Design)	In Work	2014-07-16 08:48
WASHER_THK062	54194-043.PRT	A.2	In Work	2014-07-16 08:48
WASHER_THK062	54194-003.PRT	A.2	In Work	2014-07-16 08:48

- Enable enterprise access to materials knowledge, from Creo and Windchill
- Deploy
 - Approved corporate materials knowledge and Granta's authoritative reference data
 - Rapid access for users
 - Control, consistency, and traceability of data
- Embed
 - Product analytics, risk assessment, and materials guidance tools
 - Early in product design process
- Support wider corporate strategies of material standardization, supply risk reduction, lightweighting, ...

Visit us on Booth B16

- www.grantadesign.com/products/mi/proe/
- www.grantadesign.com/products/mi/windchill/
- www.grantadesign.com/products/data/

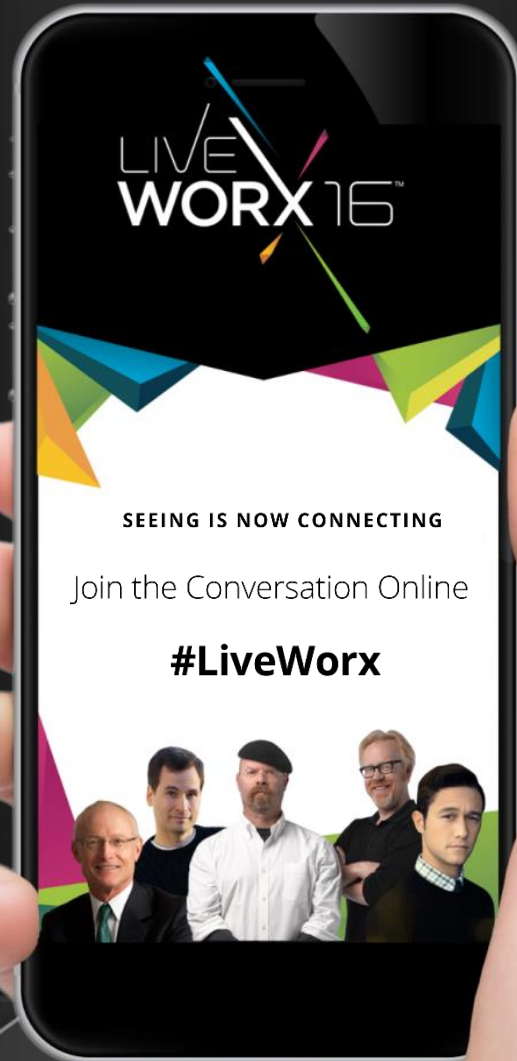
THANK YOU!

The image features several colorful geometric shapes, including triangles and lines in shades of blue, green, yellow, orange, pink, and purple, scattered across the background. A large, multi-colored geometric shape is prominent on the right side. The text 'LIVE WORX 16' is centered, with 'LIVE' in a thin, spaced-out font and 'WORX 16' in a bold, black font. A black bar with white text is positioned below 'WORX'.

LIVE
WORX 16™

TAKE A FRESH LOOK AT THINGS

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Access the latest schedule and join
the conversation on social media
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