

mat 

a world of materials

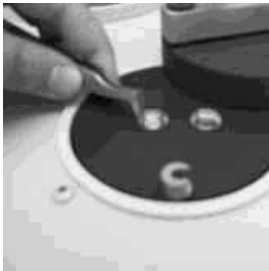
many products



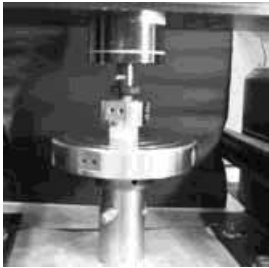
reality

each with its own reality

material data



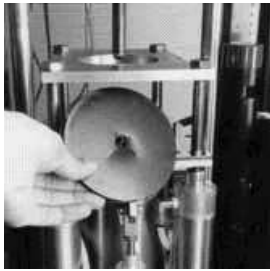
stress relaxation



compressive



viscosity



fatigue



conductivity



expansion

properties that describe reality



web services for material data

Paperless MDM Improves Quality and Availability of Material Data

Hubert Lobo



Problem

Why all this?

Except for simple cases....

- Material properties are not definitive!
- Handbook values are typical, not representative
- You cannot possibly measure all the possible nuances of a materials behavior- nor would you be interested

Problem

Material properties differ...

- Properties depend on the application
 - on test conditions:
 - temperature
 - rate
 - time
 - environmental exposure
 - the samples
 - the test specimens

Problem

What's good for selection...

- The correct material property for a particular use may not be the right one for another application
- Conversely, it is pointless developing properties outside the context of an application

can be bad for VPD!

Example

Case 1

- Automotive- Fuel Tank
 - Material : Polyethylene (PE)
 - Deformation: large, low temp failure
 - Model: *ELASTIC/*PLASTIC
 - Data needed: stress-strain curve:
 - fuel soaked specimens
 - -40C
 - Typical data: taken on virgin resin at 23C
- Reality:
 - Data at -40C is needed
 - Much stiffer, brittle failure?

Problem

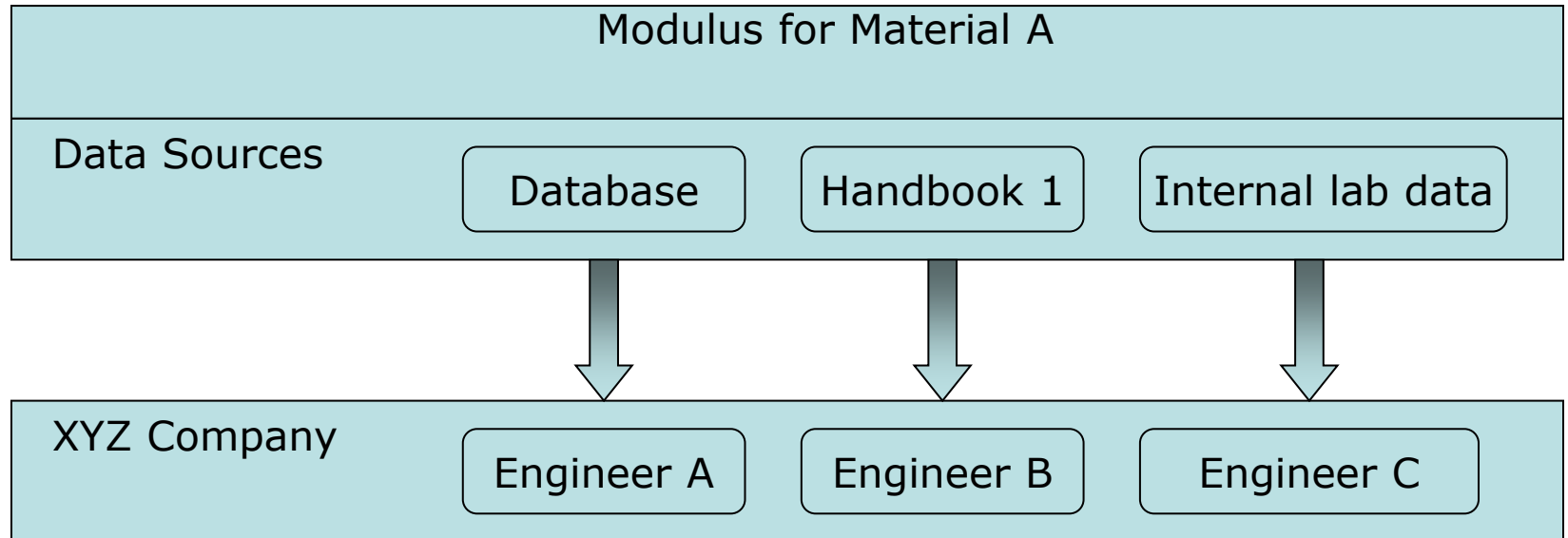
Finding the right data

- Imagine wading through enormous swamps looking for the right data
 - Handbooks
 - Internet
 - Databases
 - File cabinets
 - Colleagues and co-workers



Problem

Inconsistent use of data

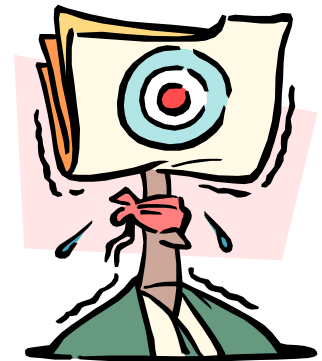


the six sigma killer...

Problem

Poor properties can be fatal

- Property no longer represents the behavior being simulated
- Can be a root cause of error in CAE
- Presents a serious credibility problem for analyst, CAE tool, and VPD



How to avoid this?

- Understand the environment that is being simulated
- Translate the behaviors into a set of measurable property requirements
- Pay heed to the underlying assumptions
- Develop representative properties
- Use consistently across VPD platform

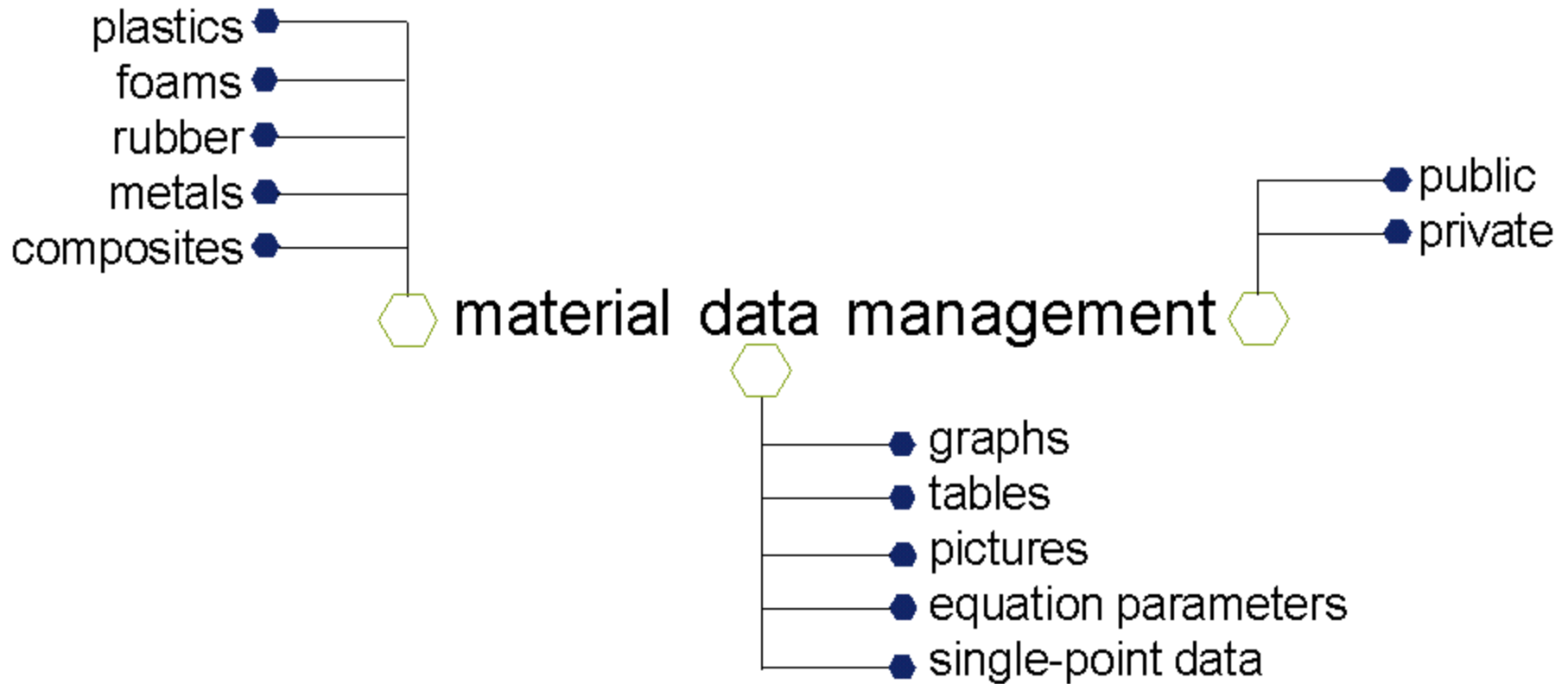
The big picture

- We need to store a multitude of varied properties
- Which depend on the end use application
- For diverse applications
- For diverse material types
- Useable in a variety of CAE solutions

a major mess...

Solution

Introducing Matereality

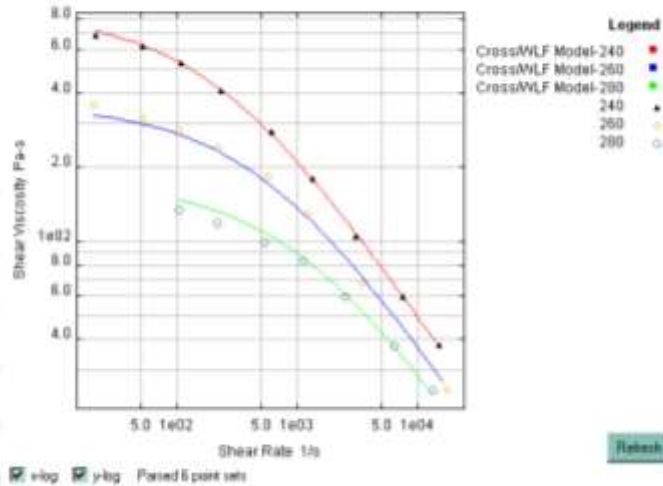


Solution

Handles data diversity

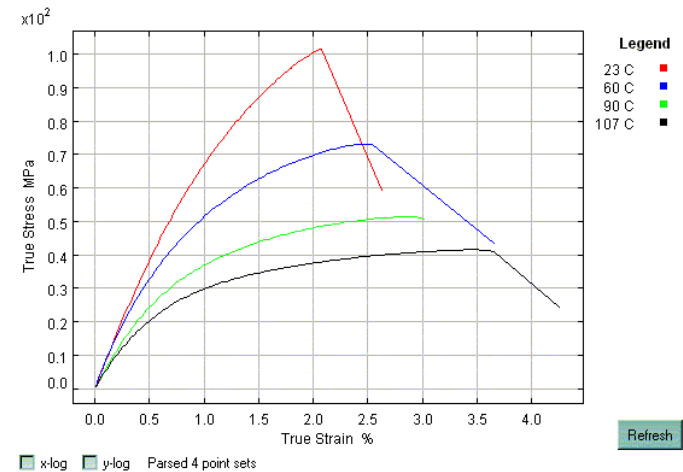
EMERGE 7550 - Capillary Viscosity

Cross/WLF Model



StaMax40YM240 > Tensile Properties
Effect of test temperature

True Tensile Stress-Strain Curves



Solution

Stores pertinent data

The screenshot displays the Matereality website interface. At the top left is the Matereality logo. A navigation bar contains links for Home, Help, and Export. The page title is "Confidential Demo Purposes's Matereality". A breadcrumb trail reads: default > searchengine > searchengine2 > templatesearch > resgroupsummary. The main heading is "QUESTRA® EA 540 > Moldex". Below this, a note states: "Click on the property titles below to view data".

The data is organized into several sections, each with a title and a list of property links:

- Ni-Flow Temperature**
 - No-Flow Temperature
- Specific Heat**
 - Transition Temperature
 - Specific Heat v. Temperature Curve
 - Specific Heat v. Temperature Data
- Capillary Viscosity**
 - Cross/WLF Model
- Thermal Conductivity**
 - Thermal Conductivity v. Temperature
- Pressure-Volume-Temperature**
 - Two Domain Tait Model

At the bottom center, there is a green "Export" button. On the left side of the page, there is a vertical navigation menu with links: my account, my materials, search, my seen, and contact us.

Material names are trademark of The Dow Chemical Company

Solution

Records traceability

The screenshot displays the Matereality website interface. At the top left is the Matereality logo. Below it are navigation links: Home, Help, Logout. On the right, it says "Datapoint Labs's Matereality". A breadcrumb trail reads: default > searchengine > searchengine2 > searchengine3 > prepsummary > prepresult > prepresultparams. The main heading is "Measurement Details for EMERGE *550 - Capillary Viscosity". On the left side, there are links: mymaterials, search, submit data, new data, and contact us. The central content is a table with the following data:

Technique	standards organization	ASTM
	standard number	D3835-96
	uncertainty analysis	per standard
Sample Details	identification	5209
	source	client
Corrections	data correction	Rabinowitsch
Specimen Details	drying	none
	form	pellets
	other preparation	none
Test Parameters	barrel diameter	12 mm
	die diameter	1 mm
	die entry angle	180 deg
	die length	20 mm
	preheat time	6 min
	test temperature	240 C
Traceability	test temperature	260 C
	test temperature	280 C
	measurement date	3/4/2002
	accredited	Yes
Traceability	measurement instrument	Goettfert Rheograph 2003 Capillary Rheometer
	performed by	JA
	certified by	TB

At the bottom of the table area, there are links: Print, Report, View Result, Update, Legal.

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Solution

Displays variability

Tensile Modulus - Youngs

2223 MPa	1
2138 MPa	2
2229 MPa	3
2197 MPa	Average

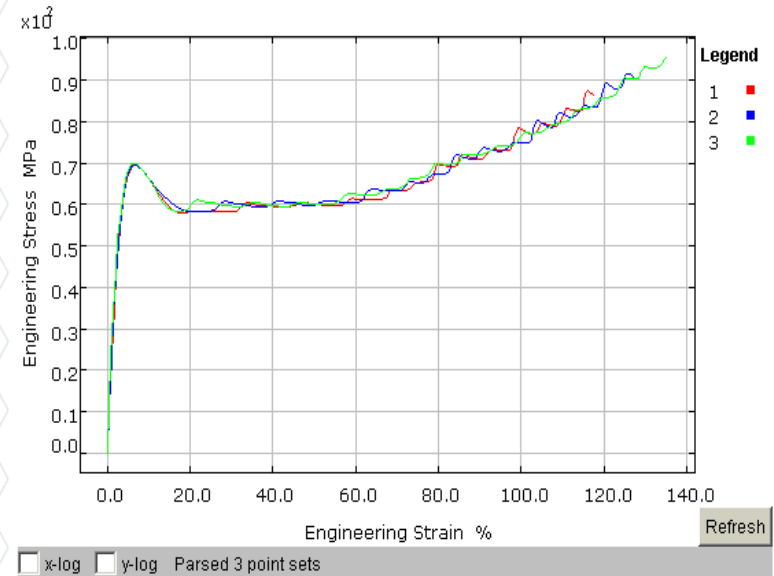
Offset Yield Stress in Tension

44.27 MPa	1
46.04 MPa	2
41.07 MPa	3
43.79 MPa	Average

Offset Yield Strain in Tension

2.12 MPa	1
2.24 MPa	2

Engineering Tensile Stress-Strain Curves



Example

Application to VPD and beyond

Part designer's matereality

- Stress-strain data
- Impact data
- Refractive index

Moldflow analyst's matereality

- Viscosity
- Thermal conductivity
- Melt density
- Specific heat
- No-flow temperature

Molder's matereality

- Melt flow rate
- Izod strength

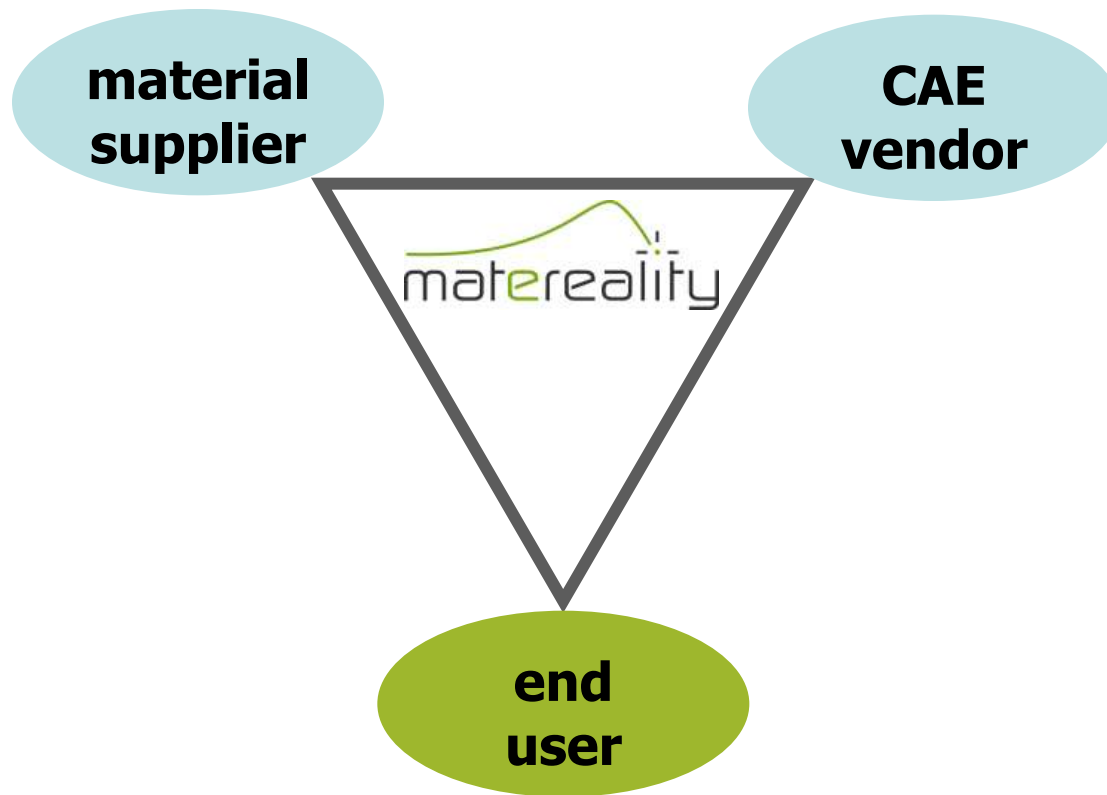
Product: safety glasses



Material: polycarbonate

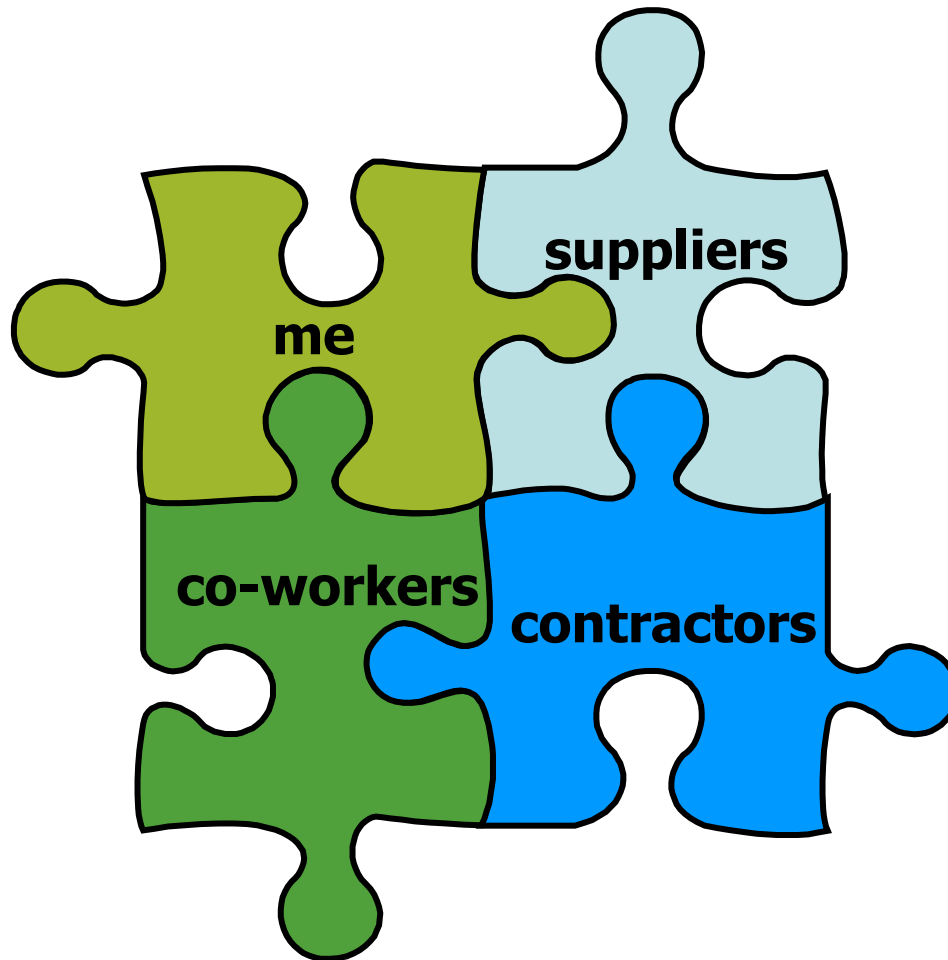
Collaborate

Stakeholders in VPD



Collaborate

Matereality is collaborative,



Collaborate

flexible,

- Highly efficient data pipelines



Collaborate

secure!

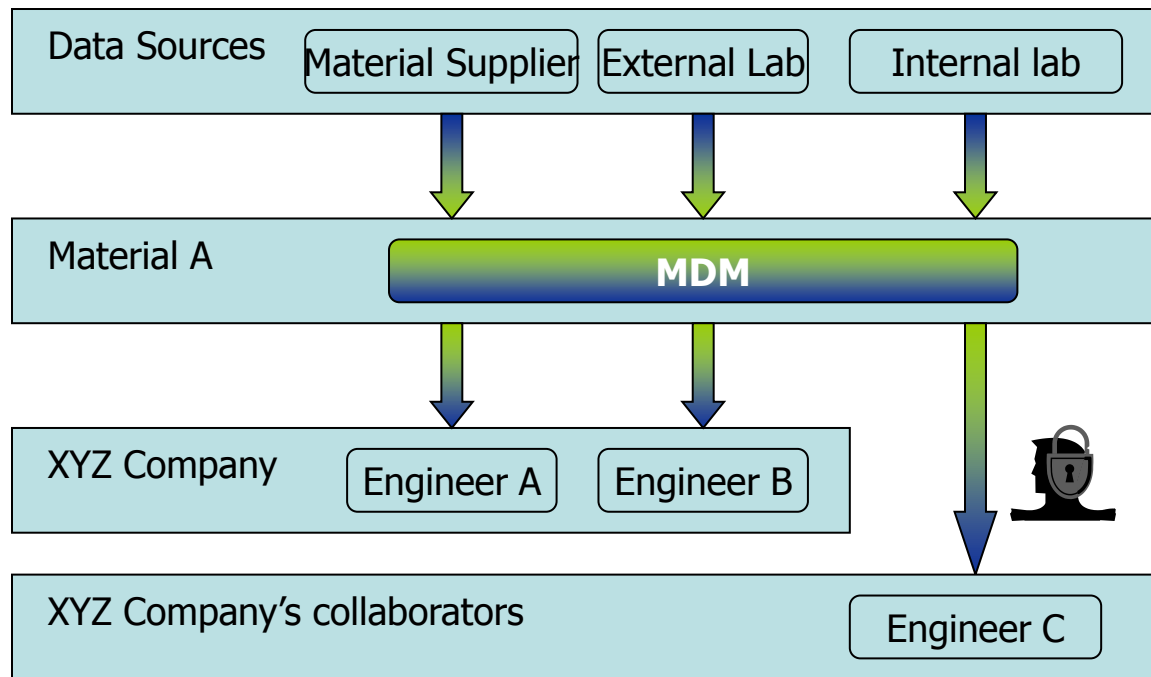




matereality

creates **secure**, flexible networks

Matereality applied consistently



Cost savings

- Only the properties needed are measured
- Once measured, properties are shared by all stakeholders
- Reduced risk- no searching in dubious places for data

Conclusions

- Authoritative source of material data
- Stores entire context of data (paperless)
- Handles any kind of material data
- Selectively shareable by stakeholders
- Achieves cost benefits
- Reduces risk
- Extensible to entire product life cycle

www.matereality.com

- Available to all
 - For individuals- Matereality4Me
 - For small groups- MaterealityDomain
 - For test labs- MaterealityProvider
 - For enterprises-MaterealityEnterprise