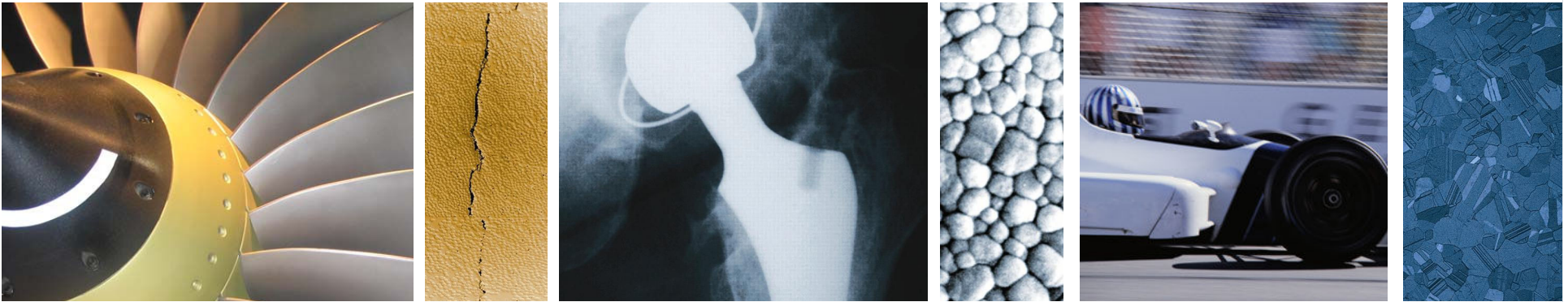


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MATERIAL INTELLIGENCE



Materials Challenges for Wind Turbines

Agenda

Introduction

- Steve Warde

Why is materials information management important?

- Dan Oldridge

Materials Challenges for Wind Turbines

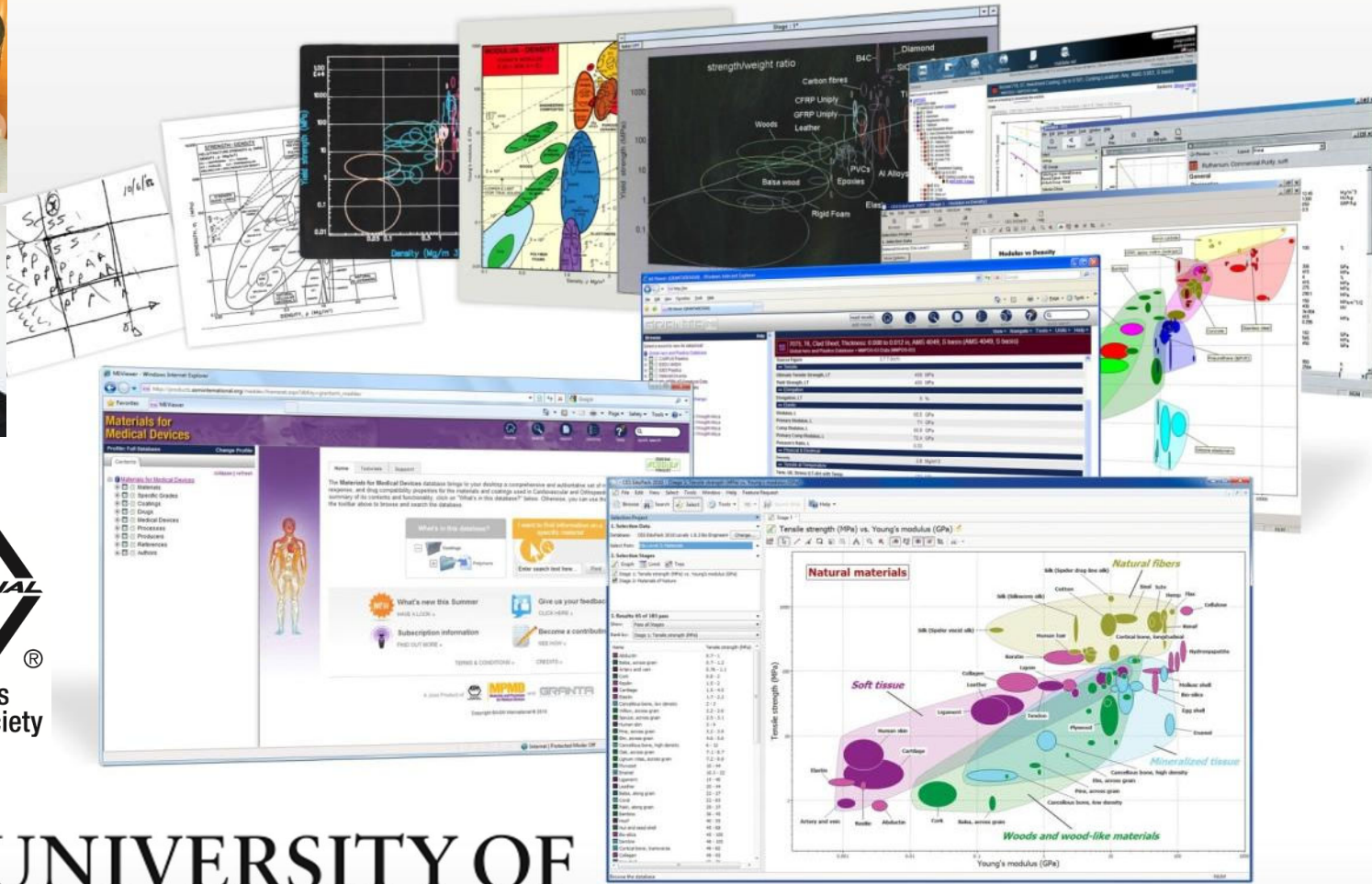
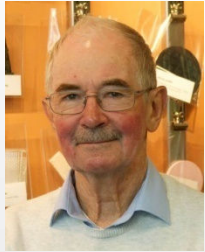
- Ian Stewart, Vestas

Demo

- Ben Meyer

Q&A

Granta Design—innovating since 1994



The Materials Information Society



UNIVERSITY OF CAMBRIDGE

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MATERIAL INTELLIGENCE

Materials Challenges for Wind Turbines

Decrease
"cost of energy"

Increase
blade size

Gain
competitive
advantage

Product Performance

Strategic Priorities



Increase industry
and brand image

**Design confidence
and reliability**

Reduce materials
costs

Reduce
maintenance costs
and risk

IEC WT-01 Blade
Certification

One single
source of the
truth

**Design to
Manufacture**

Get products to market
quicker

Retain and use
knowledge in design

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Materials Challenges for Wind Turbines

Inconsistencies occur due to incorrect data being used

Manual entry of materials data into FEA takes time and is error prone

Engineers spend significant amounts of time looking for data

Design and Analysis

Tactical Priorities



Can't easily trace design data back to test results

Materials

Can't easily compare new systems with existing materials

Data is difficult to find / data gets lost

Need to work closely with suppliers

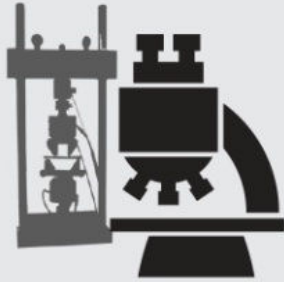
Processing

Can't easily find and compare processes

Lack of data to make optimum process selections

Can't easily compare cure conditions / other parameters

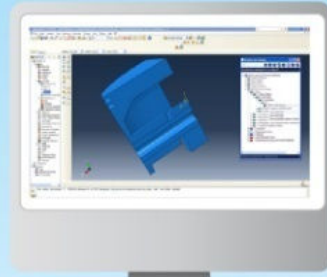
Types of Materials Data



Research

Materials R&D

- Testing
- Characterization
- Statistical analysis
- Reports
- Certification
- Environmental impact



Design

Decision support data

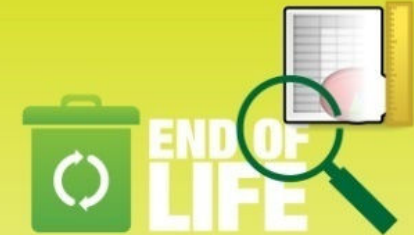
- Certified design data
- Reference data (Properties, cost, eco)
- Purchasing specs
- Preferred materials
- Restricted substances



Production

Materials QA

- Batch testing
- SPC data
- Comparison with specs
- Process improvement



In-service & end-of-life

Materials performance

- Failure reports
- In-service testing
- Empirical knowledge
- Materials substitution
- Cost reduction
- Materials aging
- Recycling & disposal

Is the same source data being used in each case?

Is everybody using the most up-to-date information?

Is the quality and pedigree of the information easily found and assured?

Is time wasted finding, analysing and comparing this data?

Guest Speaker

Dr Ian Stewart, Manager

**Design for Manufacture and Systems, at Vestas Blades
Technology.**

Materials Challenges for Wind Turbines

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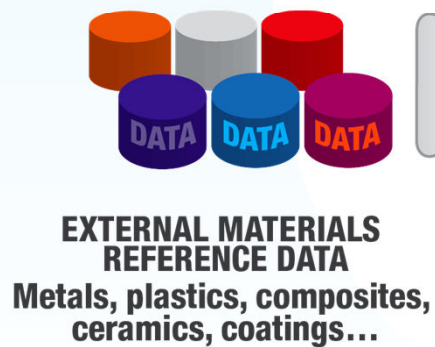
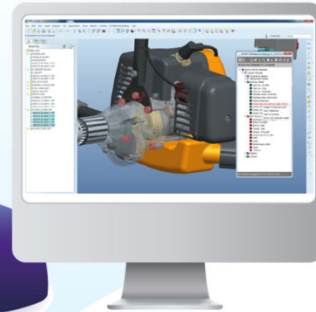
Designed in collaboration with leading aero & energy enterprises

Integrate with CAD, CAE...

Study & Inform

Search & Report

Visualize & Analyze



Benefits of materials information technology

Manage critical materials information

- From testing, QA, research, design

Traceability + data aggregation = greater statistical confidence

- Push materials closer to their performance limits

Improve the efficiency of the product development process

- Simulation engineers, designers get data, when & where it's needed

Better materials decisions, balancing cost and performance

Retain and manage knowledge about highly complex materials

- Zero data loss

Demonstration

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Ben Meyer, Granta Design

Summary

Manage critical materials information

- From testing, QA, research, design

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Demo

- Ben Meyer

Q&A

Further Information

Further Reading:

- **Customer Case Study**

<http://www.grantadesign.com/news/news/reports/wind.shtml>

- **Wind Energy Brochure**

<http://www.grantadesign.com/download/pdf/WindPower.pdf>

- **Website**

<http://www.grantadesign.com/solutions/energy/wind.htm>

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