Bio-based materials: How we can make mobility more sustainable

www.v2c2.at

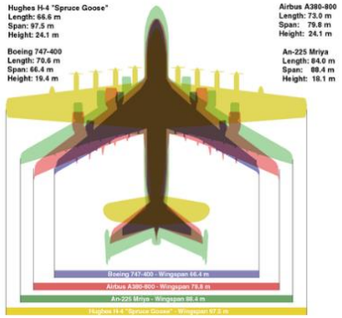
Christian Kurzböck
Lead Researcher Virtual Vehicle

Wolfgang Knöbl
Weitzer Woodsolutions

WoodC.A.R. COMPUTER AIDED RESEARCH CARpenTiER

What if?

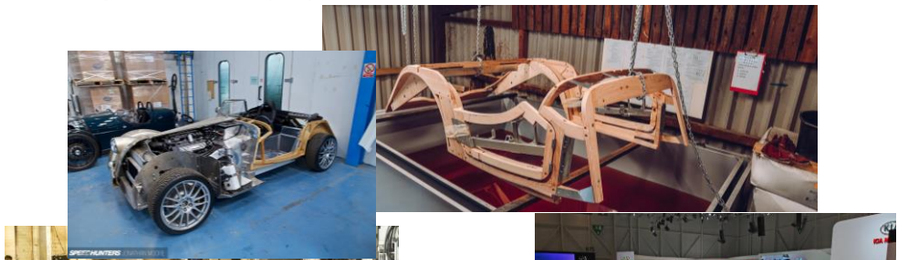
More than 70 years of high-performance industrial applications



De Havilland Mosquito bomber, Cessna AT10, H-4 Hercules named the Spruce Goose, Giant Plane Comparison

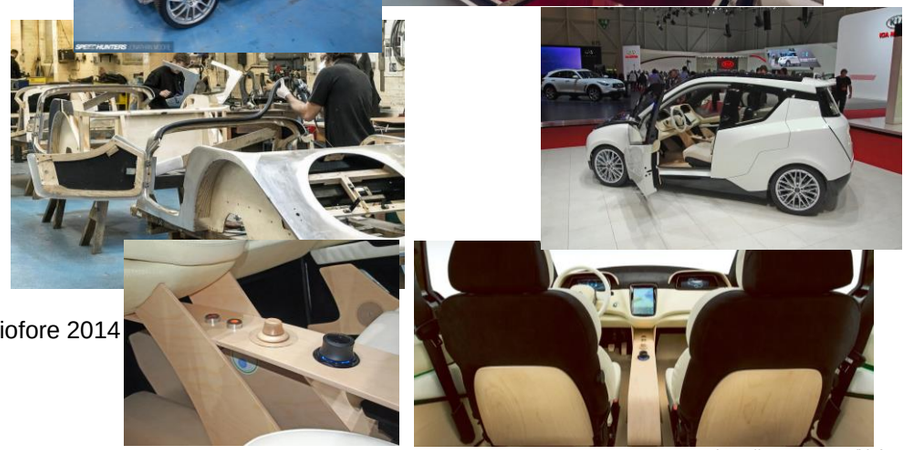
Wooden bicycle frame

Morgan Motor Company



Train bogie

Concept Car Biofore 2014

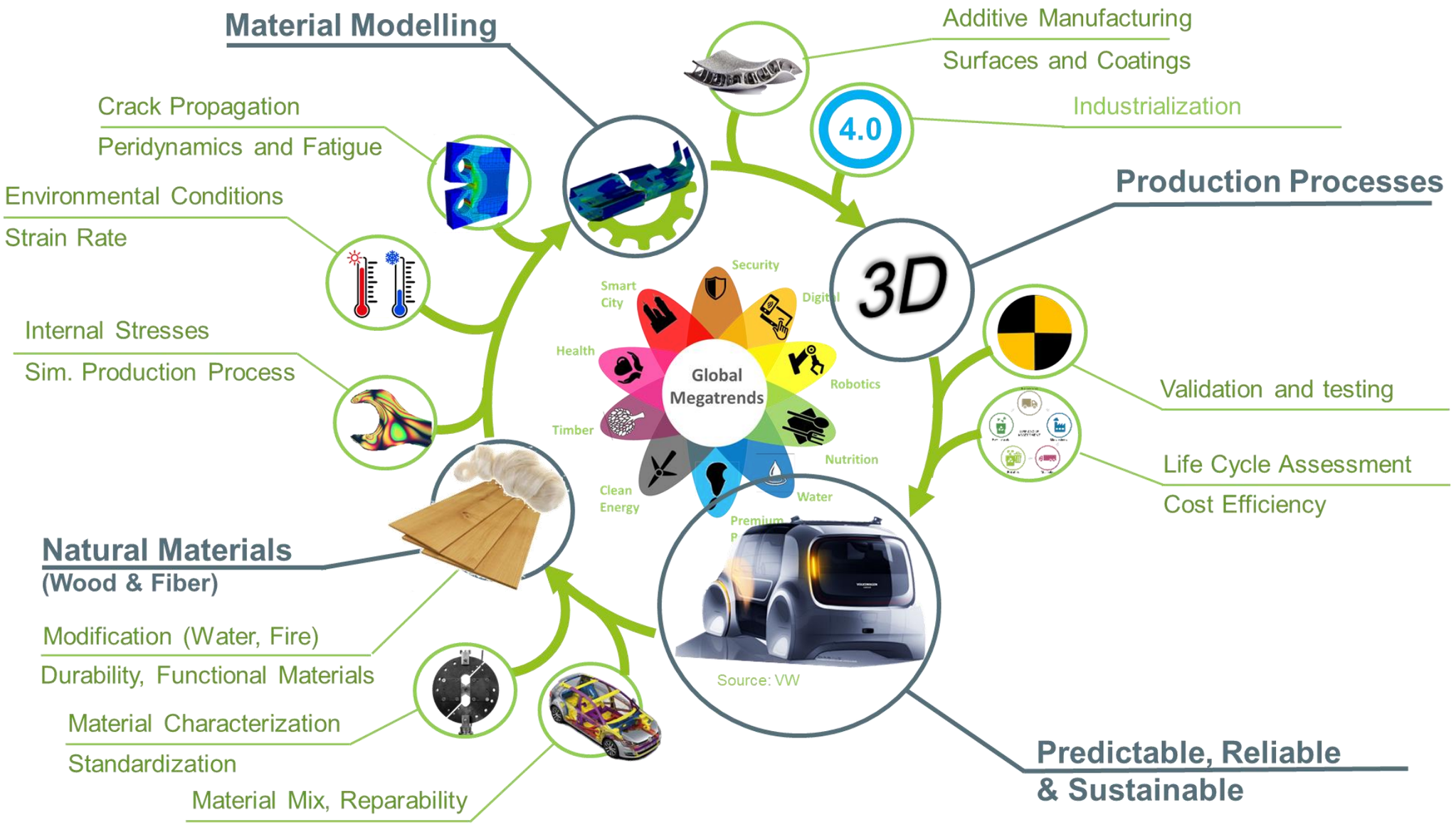


https://www.upm.com/bioforeconceptcar/

What we had/have to do

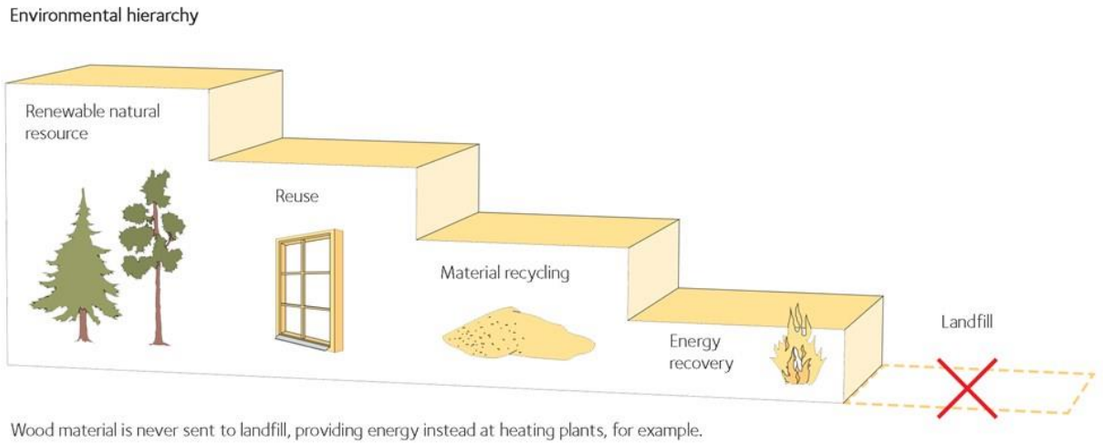
virtual vehicle

WoodC.A.R. CARpenTiER
COMPUTER AIDED RESEARCH

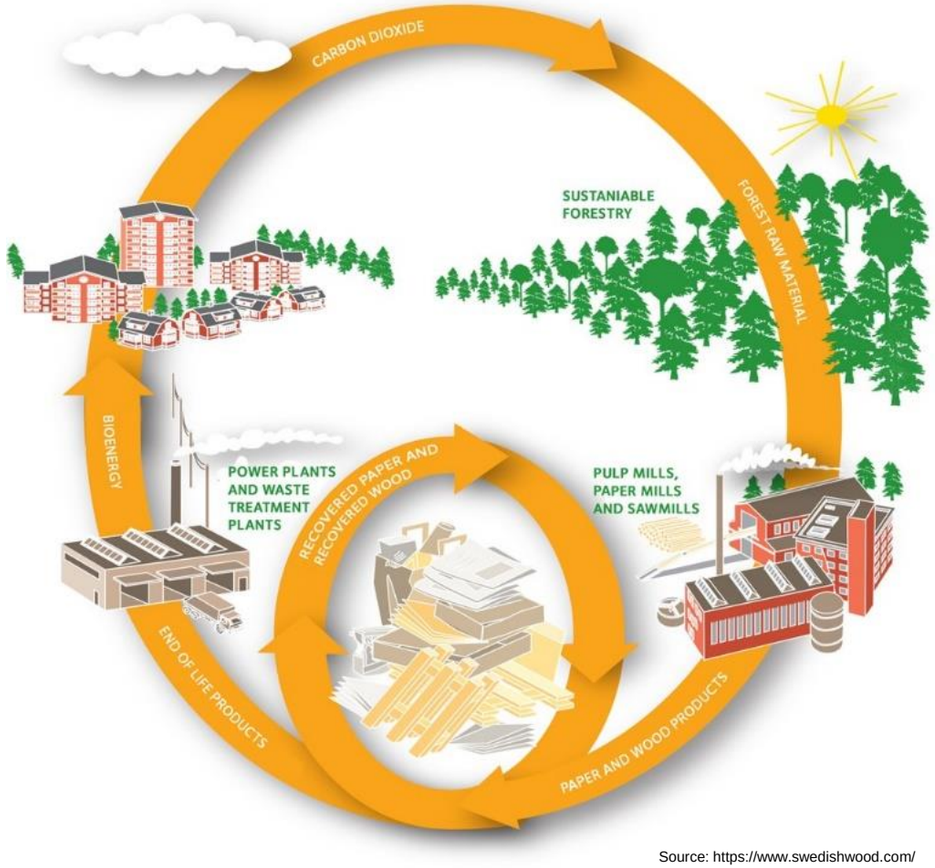


Renewable Domestic Raw Material

- **Reasonably priced, sustainable availability in Austria**
- **Short transport routes and entire supply chain in Styria**
- **Low energy consumption compared to conventional materials**
- **Wood has two ecocycles compared to conventional materials**
- **Possibility of waste recycling (Enviromental hierachy)**



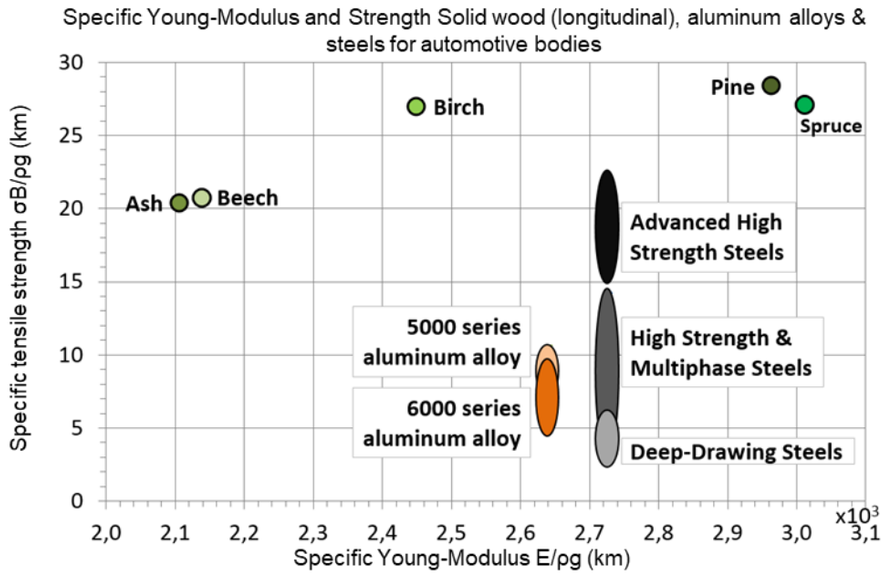
Source: https://www.swedishwood.com/



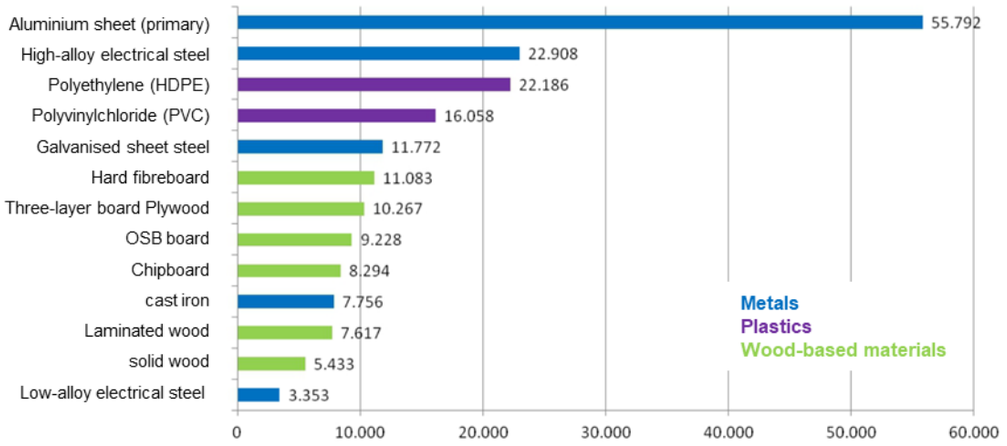
Source: https://www.swedishwood.com/

Economic, ecological and technical aspects

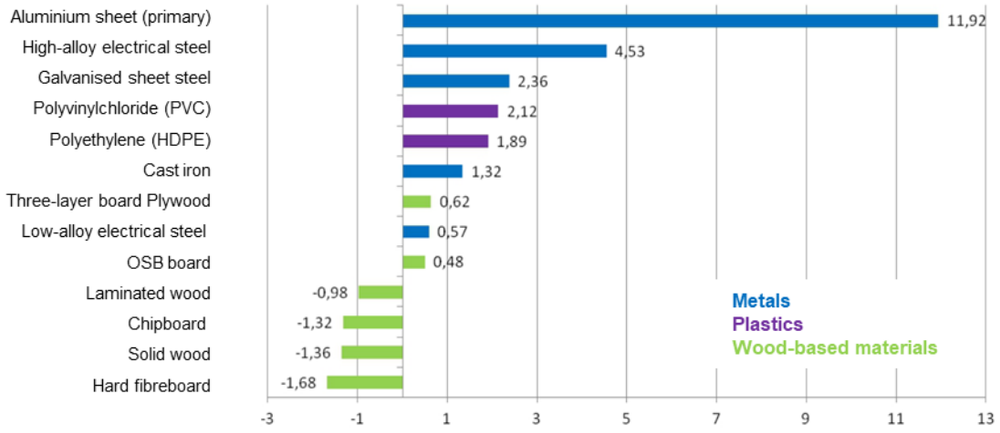
Mechanical properties



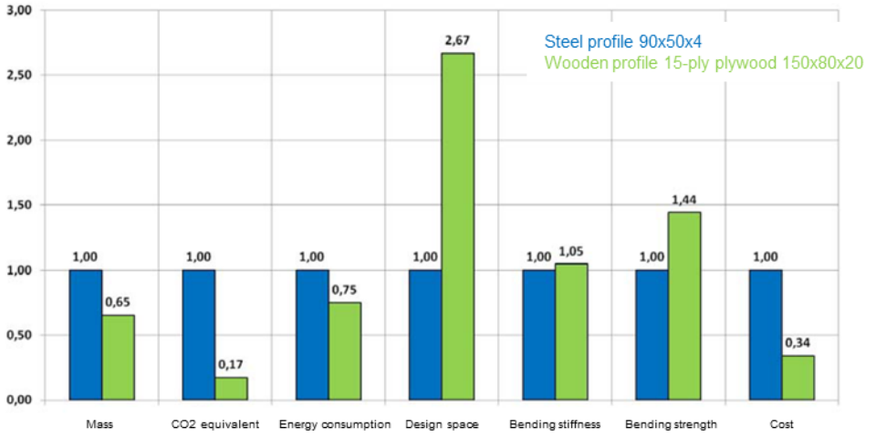
Energy input in kWh/t



Global warming potential in tonnes of CO_2 equivalents/t



Comparison of rectangular tube steel/plywood
(Bending stiffness)

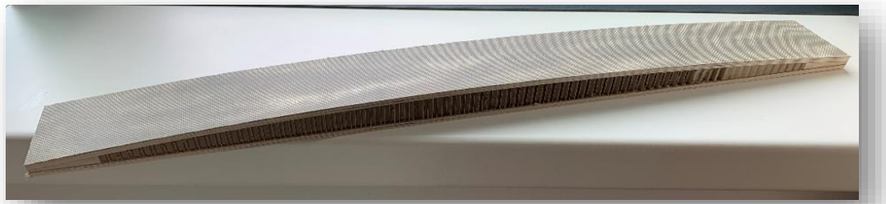


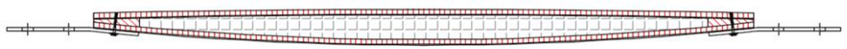
Source: Müller, Christoph, et al; Wood as a Material in Mechanical Engineering - Concerns and Requirements; Tagungsband, narotech 2012, 9. Internationales Symposium „Werkstoffe aus nachwachsenden Rohstoffen“, 2012

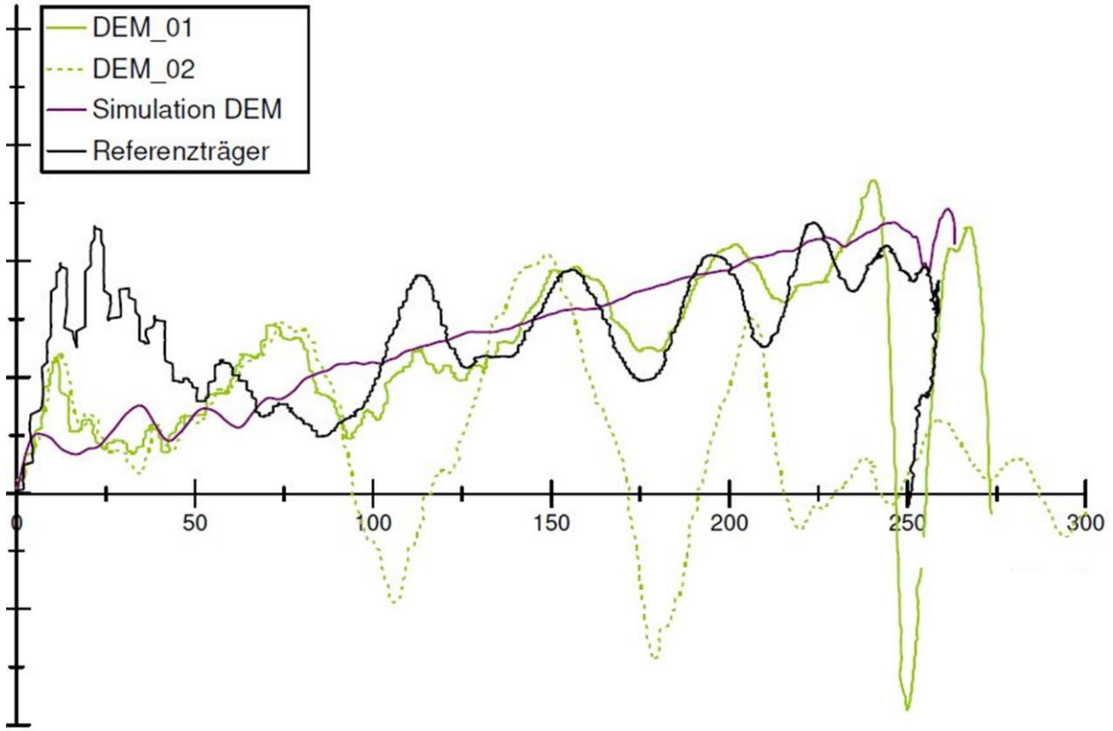
Whats next?

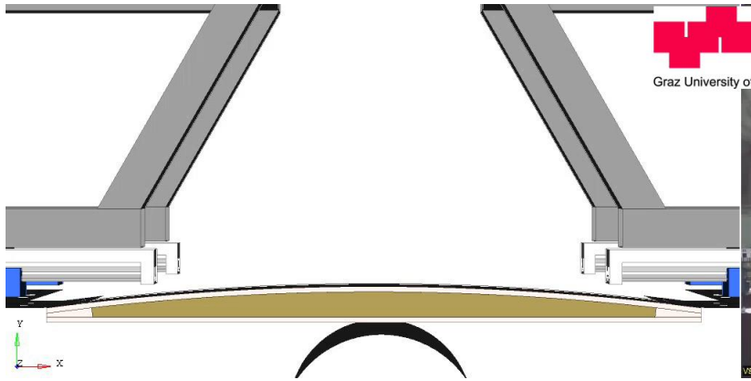
Source: https://vincent.callebaut.org/object/230317_timbermobility/timbermobility/projects

Side-Impact-Beam Virtual Validation









Conclusion

High lightweight potential

Very good specific mechanical, thermal and damping properties

Efficient component production through new production technologies

Very good fracture behaviour and modification capabilities

Short transport routes and sustainable availability in Austria

Low energy consumption compared to conventional materials

Possibility of waste utilisation (environmental sustainability)

Wood has two ecological cycles compared to conventional materials

Very cost-effective compared to other construction materials

Possibility of CO_2 storage (CO_2 certificates)

Cost-efficient supply chain

Virtual design and validation tools

Digital twins of our wood hybrid products

Virtual optimization and on the edge design

Virtual mapping of the entire product and life cycle

Acknowledgement

The authors are grateful for research funding from the Federal Ministries BMK and BMAW as well as the Province of Styria within the COMET - Competence Centers for Excellent Technologies program, and for funding from the companies ACstyria Mobilitätscluster GmbH, BASF SE, BASF Polyurethanes GmbH, DYNAmore Gesellschaft für FEM Ingenieurdienstleistungen mbH, evon GmbH, Fill Gesellschaft m.b.H, Forst-Holz-Papier, Glanzstoff Management Consulting GmbH, Holzcluster Steiermark GmbH, IB STEINER, Klumpp Coatings GmbH, LEAN Management Consulting GmbH, Pfeifer Holding GmbH, Volkswagen AG und Weitzer Woodsolutions GmbH. The COMET program is handled by the Austrian Research Promotion Agency (FFG, 882509) and the Styrian Business Promotion Agency (SFG, 1,000,065,896).

Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie

Bundesministerium Arbeit und Wirtschaft

FFG Promoting Innovation.

Das Land Steiermark – Wirtschaft, Tourismus, Regionen, Wissenschaft und Forschung

SFG NEUES DENKEN. NEUES FÖRDERN.

www.carpentier.at

www.woodcar.eu

Project Consortium

virtual vehicle

WoodC.A.R. COMPUTER AIDED RESEARCH

Scientific Partner

Innovationszentrum W.E.I.Z.

BOKU

virtual vehicle

TU Graz

UNI GRAZ

FH JOANNEUM

Industry Partner

AC STYRIA

doka

EJOT

DYNA MORE

FHP READER

VOLKSWAGEN AKTIENGESELLSCHAFT

MAN

MATTRO Driven By EcoLogic

MAGNA

Weitzer Parkett

Collano

IB STEINER

holzcluster steiermark gmbh

>LEAN

Project Consortium

virtual vehicle

CARpenTiER

Scientific Partner

Innovationszentrum W.E.I.Z.
Der Standort für Forschung, Bildung & Wirtschaft

BOKU

virtual vehicle

TU Graz

UNIVERSITÄT GRAZ
UNIVERSITY OF GRAZ

UNI GRAZ

Industry Partner

AC STYRIA MOBILITÄTSCLUSTER

BASF
We create chemistry

DYNA MORE

evon

FHP
FORST HOLZ PAPIER

FILL
YOUR FUTURE

HOLZCLUSTER steiermark

IB STEINER

INDORAMA VENTURES

KLUMPP COATINGS

LEAN

PFEIFER

VOLKSWAGEN
AKTIENGESELLSCHAFT

Weitzer Woodsolutions

virtual vehicle

ENABLING **FUTURE VEHICLE** TECHNOLOGIES

THANK YOU

christian.kurzboeck@v2c2.at

www.v2c2.at

Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie
Bundesministerium Arbeit und Wirtschaft
FFG Promoting Innovation.
Das Land Steiermark Wirtschaft, Tourismus, Wissenschaft und Forschung
SFG

Virtual Vehicle Research GmbH wird im Rahmen von COMET Competence Centers for Excellent Technologies durch BMK, BMAW, Land Steiermark und Steirische Wirtschaftsförderung (SFG) gefördert. Das Programm wird durch die FFG abgewickelt.