

ReThink: „CFRP – Recycling and Sustainability“ Recycling of CFRP – Chance or Restriction?

Singapur



16.11.2016 @ JEC Asia

SUNTEC International Convention & Exhibition Centre,
1 Raffles Boulevard, Suntec City,
Singapur 039593

Bangkok



18.11.2016 @ KMITL

King Mongkut's Institute of Technology Ladkrabang,
Central Library 5th floor, Chalongkrung Road,
Ladkrabang District, Bangkok 10520

Kuala Lumpur



21.11.2016 @ UCSI

UCSI University, North Wing Campus, Taman
Taynton View Cheras, Lot 12734 Jalan Choo Lip
Kung, 56000 Kuala Lumpur

Recycling of CFRP – Chance or Restriction?

Famous predictions

- "I think there is a world market for maybe five computers."
Thomas Watson, president of IBM, 1943.^[1]
- "Television won't be able to hold on to any market it captures after the first six months. People will soon get tired of staring at a plywood box every night."
Darryl Zanuck, executive at 20th Century Fox, 1946.^[1]
- "Nuclear-powered vacuum cleaners will probably be a reality within ten years."
Alex Lewyt, president of Lewyt vacuum company, 1955.^[1]
- "Everything that can be invented has been invented."
Charles H. Duell, Commissioner of US patent office, 1899.^[2]



Image: <http://www.old-computers.com>



Image: <http://www.pcworld.com>



Image: <http://momentcar.com>

^[1] <http://www.pcworld.com>

^[2] <http://patentlyo.com>

Recycling of CFRP – Chance or Restriction?

How everything started a long time ago



Production capacity of high performance materials

Steel	1.600.000.000 t/a ^[1]
Aluminum	41.000.000 t/a ^[2]
Titanium	235.700 t/a ^[3]
CFRP	100.000 t/a ^[4]

^[1] <http://www.stahl-online.de>

^[2] <http://www.aluinfo.de>

^[3] <http://www.deutsche-rohstoffagentur.de>

^[4] CCeV Marktbericht

Recycling of CFRP – Chance or Restriction?

But we know, what happened next

Sustainability!

I got a feeling it
ain't gonna hurt the
big ones this time...

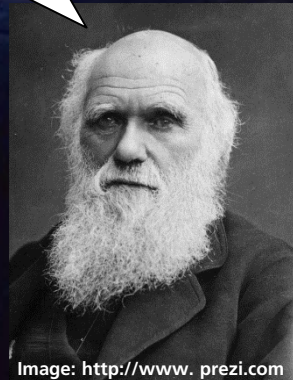


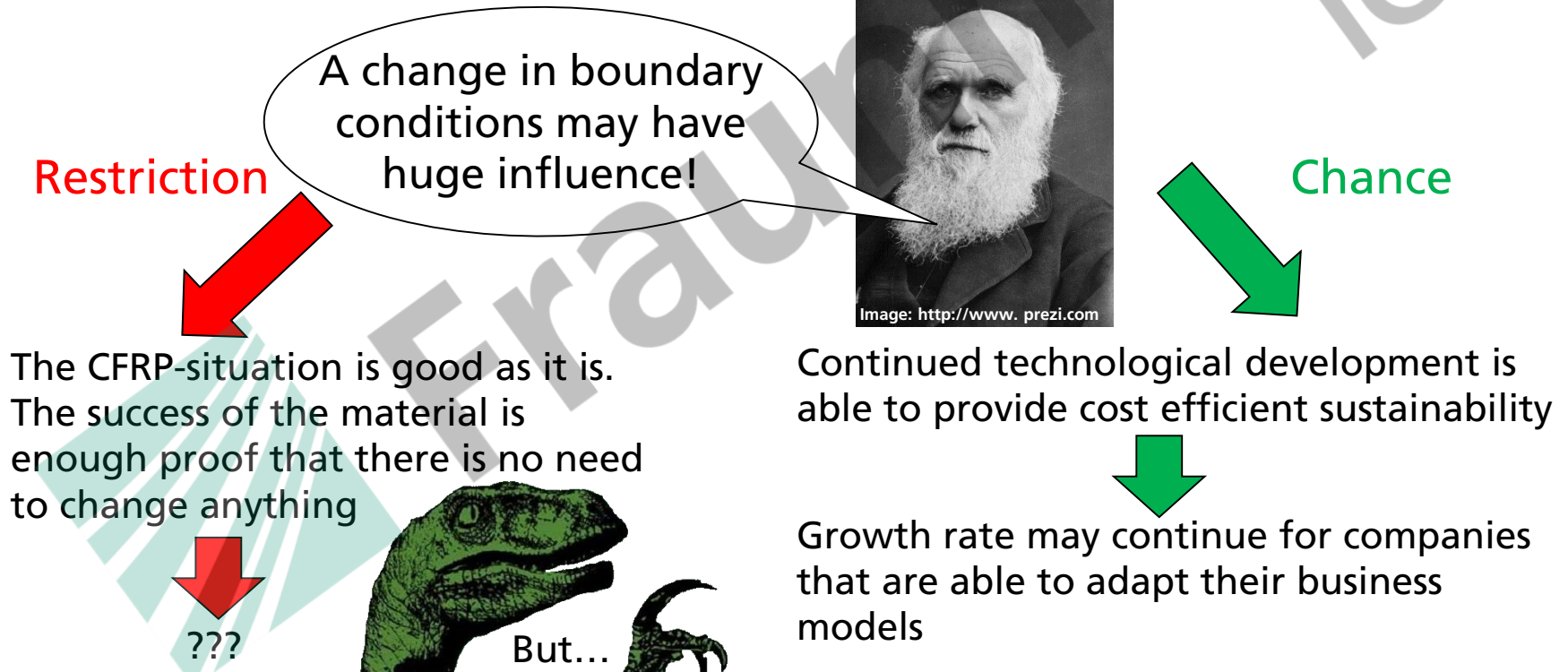
Image: <http://www.prezi.com>

Image: <http://www.spiegel.de>

Recycling of CFRP – Chance or Restriction?

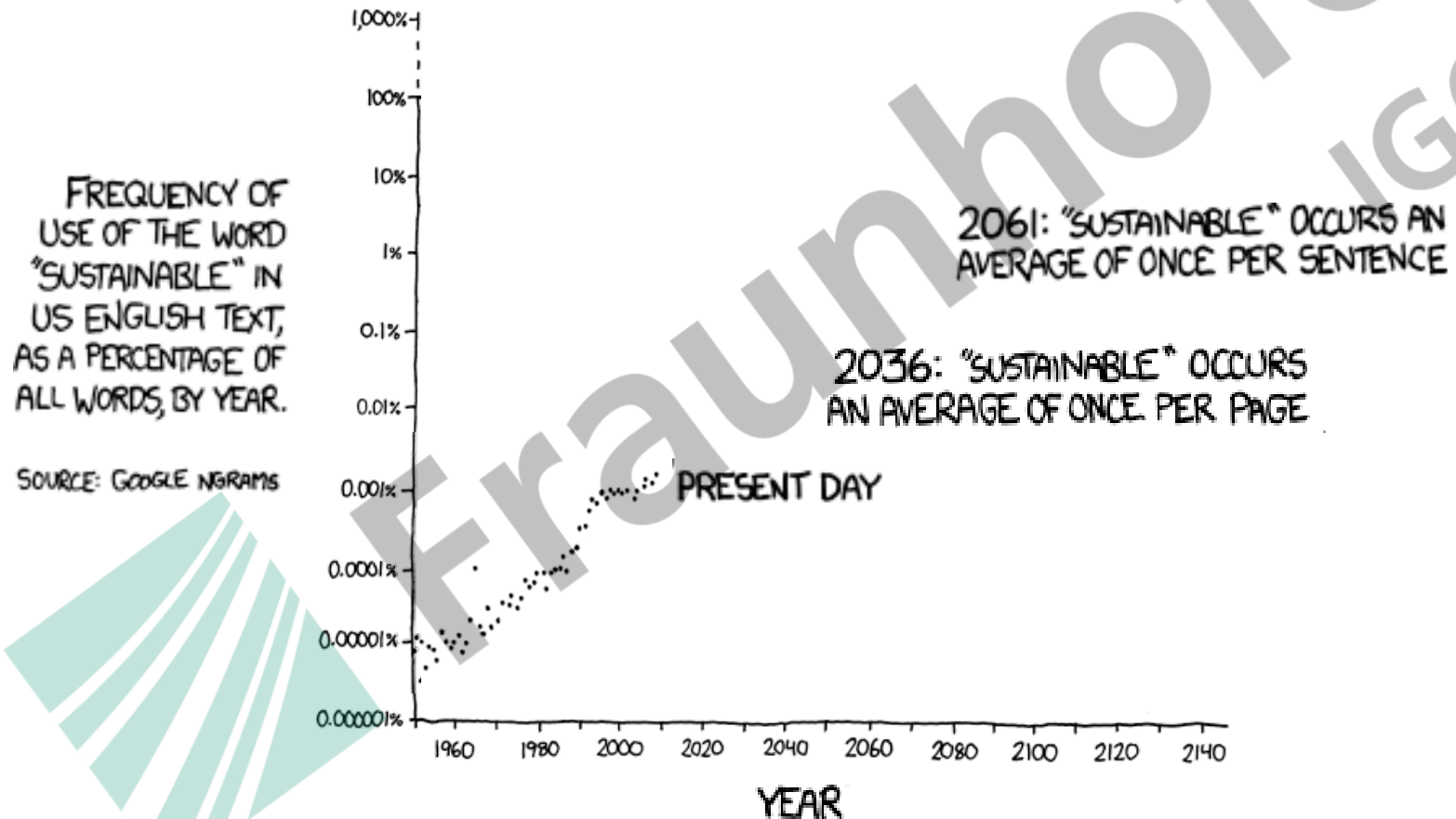
Sustainability as a watershed?

- “Ecological aspects – if these are demanded by lawmakers or not economically disadvantageous – are likely to assume greater relative importance than pure business considerations.”^[1]



Recycling of CFRP – Chance or Restriction?

OK – but what is this “Sustainability” that everybody keeps talking about?



Recycling of CFRP – Chance or Restriction?

No, seriously: what IS sustainability?

One example:

Forest science: Sustainability means that no more wood is cut than the amount that can grow in the same time.

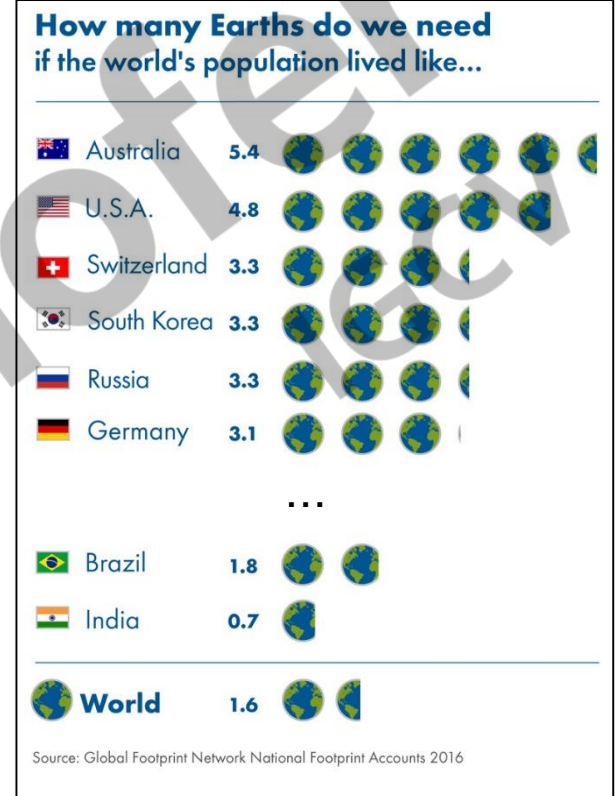


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Sustainability

- ☒ We know the meaning of the word
- ☒ Understanding the importance
- ☒ Knowledge how to realise it



But:

8th of August is "Earth overshoot day":
By this date we have consumed all resources that the environment is capable of regenerating within 1 year ^[1].

Recycling of CFRP – Chance or Restriction?

Sustainability in the context of CFRP

Production

Production of fibers

- Ressource efficiency
- Alternative ressources

Production of CFRP-structures

- Near-net-shape
- Biobased / degradable plastics
- Energy efficient technology
- Renewable Energy

Image: <http://www.manager-magazin.de>

Utilization

Lightweight

- Fuel efficiency
- Energy consumption

Maintenance

- Design for recycling
- Repairability
- Disassembly possibilities

Image: <http://www.augsburger-allgemeine.de>

End of Life

Recycling

- Disassembly possibilities
- Fast, cost efficient sorting technologies (Labelling)
- No downcycling, conservation of relevant properties

Image: <https://www.welt.de>

Recycling of CFRP – Chance or Restriction?

Where have all the fibers gone?

Responsibility for ...

- ... products that we bring into service!
- ... impacts, that technologies have that we develop!
- ... our natural environment on a worldwide level!

Europe produces approx. 42.800t/a of CFRP per year^[1]

ELG
1kt/a

CNX
1kt/a

[2]

>36.000t/a of CFRP per year

Products...



...or waste?



Who will take care of it EoL?

Recycling of CFRP – Chance or Restriction?

Why are we here today?

A lot of the CFRP parts that are produced in Europe will never be disposed or recycled in Europe. The end of life-waste will appear somewhere else.

Motivation

It is our **responsibility** to help address the problem not only in Europe, but everywhere, where it occurs and leads to problems

- ⇒ Provide knowledge
- ⇒ Develop processes to treat the waste streams
- ⇒ Transformation into cost-efficient business model

Mission

Enable decisions

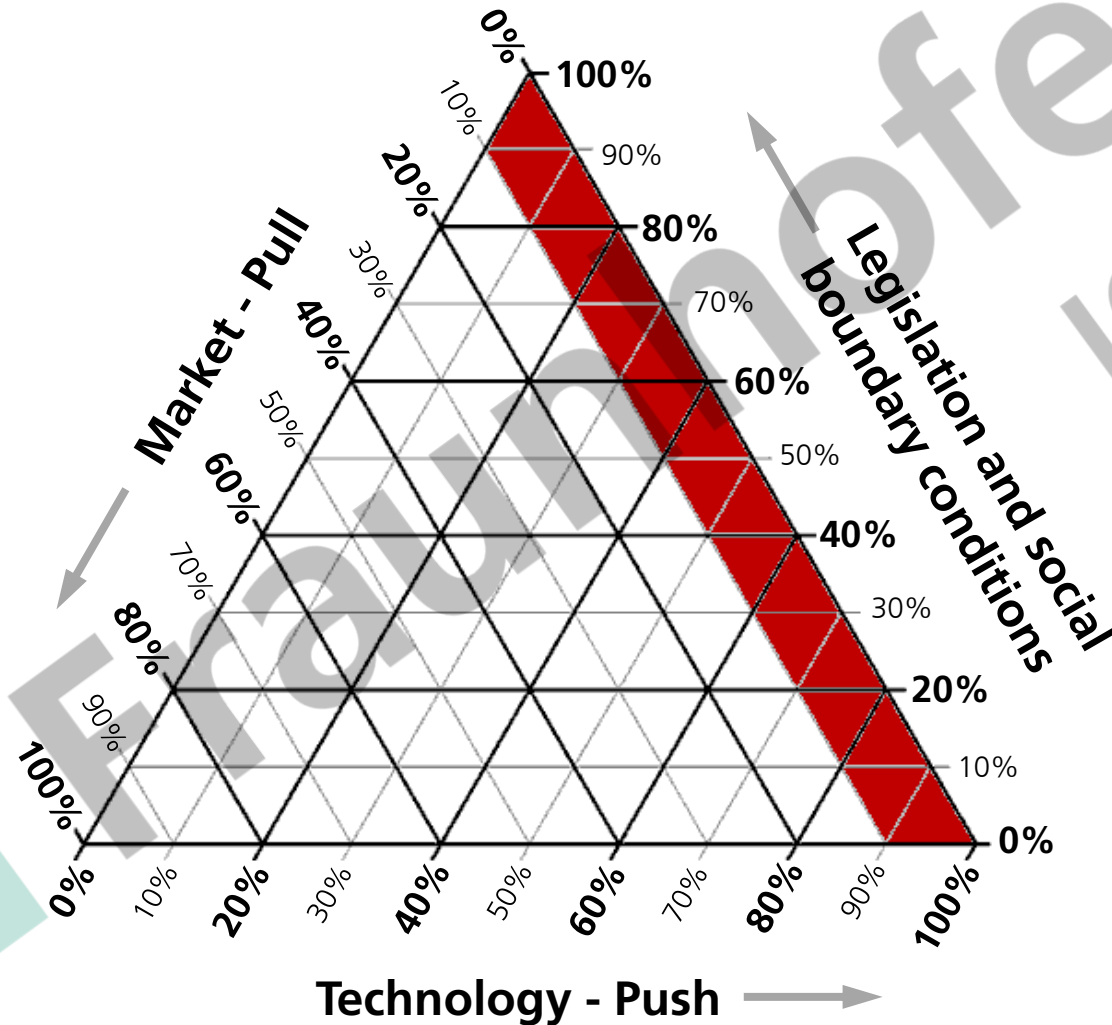
- ⇒ Is sustainability a possible threat for your products? Need for Actions?
- ⇒ Are there already existing commercial solutions that can help you?
- ⇒ Are the topics that concern you addressed by research activities?
- ⇒ Do you identify any fields of collaboration (scientific or industrial)?

Recycling of CFRP – Chance or Restriction?

Who are the actors?

Where we are
at the moment

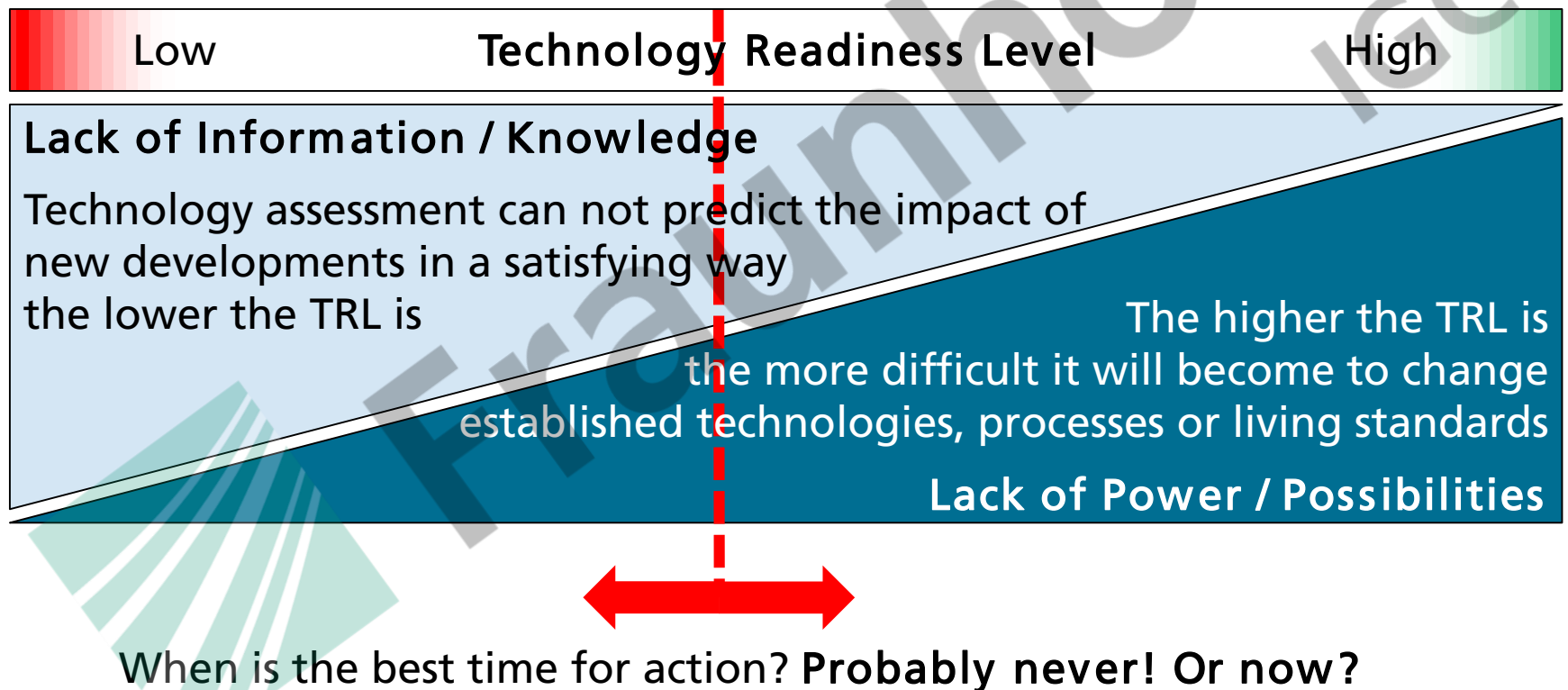
Where we need
to get as soon
as possible



Recycling of CFRP – Chance or Restriction?

When is the best time for action?

The Collingridge-Dilemma



The Fraunhofer-Gesellschaft

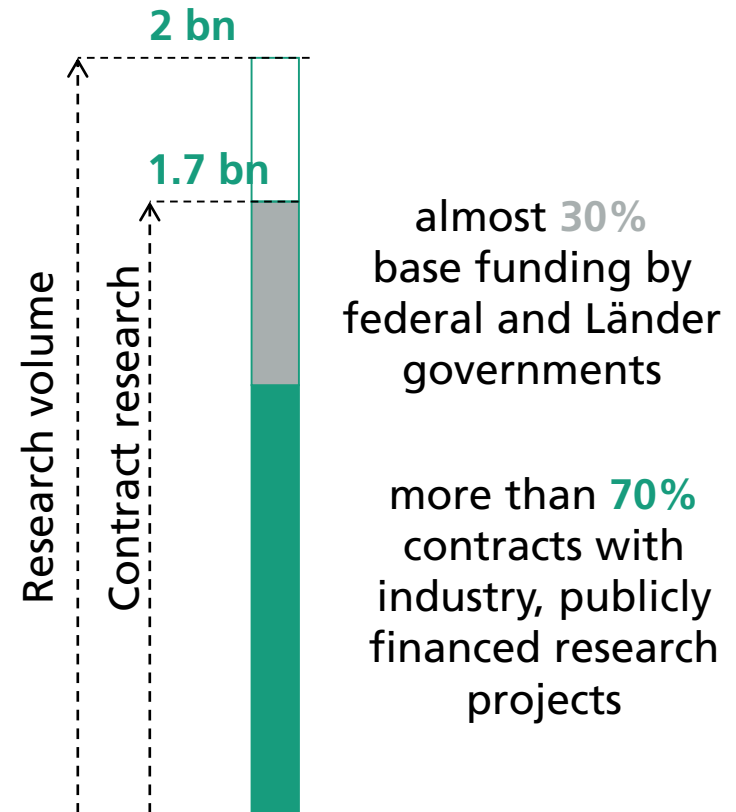
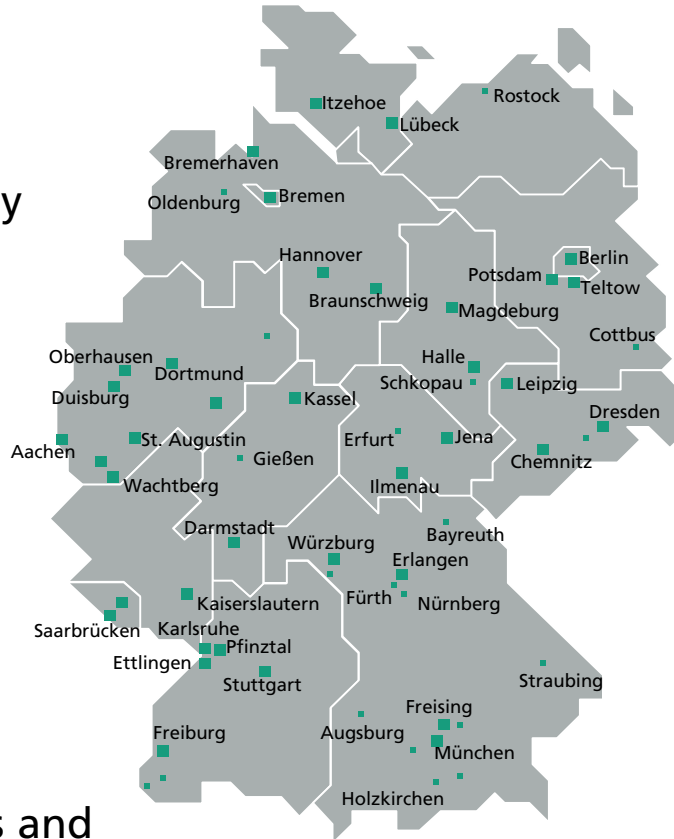
Application-oriented research for the benefit of the economy and society



Approximately
24 000
employees



68 institutes and
research units



The Fraunhofer-Gesellschaft

Fields of research

Health and
environment



Mobility and
transportation



Communication and
knowledge



Energy and resources



Security and
protection



Production and
supply of services



 **Fraunhofer**
IGCV

Fraunhofer IGCV

Facts and figures

Established: July 01, 2016

Management:

Prof. Dr.-Ing. Gunther Reinhart (executive)

Prof. Dr.-Ing. Klaus Drechsler

Prof. Dr.-Ing. Wolfram Volk

Development objective: Advancing into an independent Fraunhofer institute

Augsburg site – headquarters

Management, administration, fields of research:
processing and composite technology

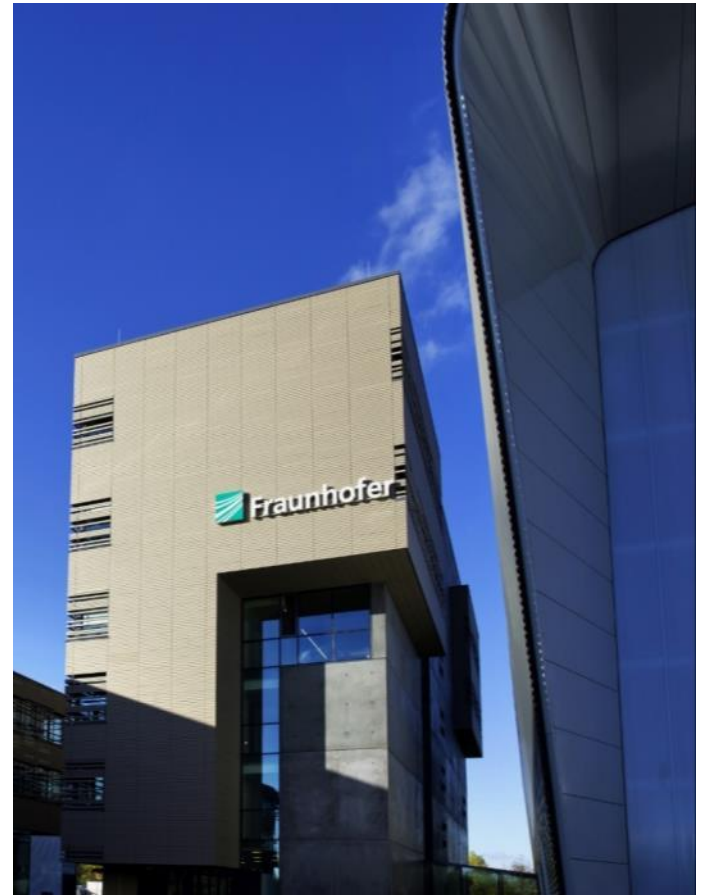
Garching site:

Field of research: casting technology

Supported by:



Fraunhofer



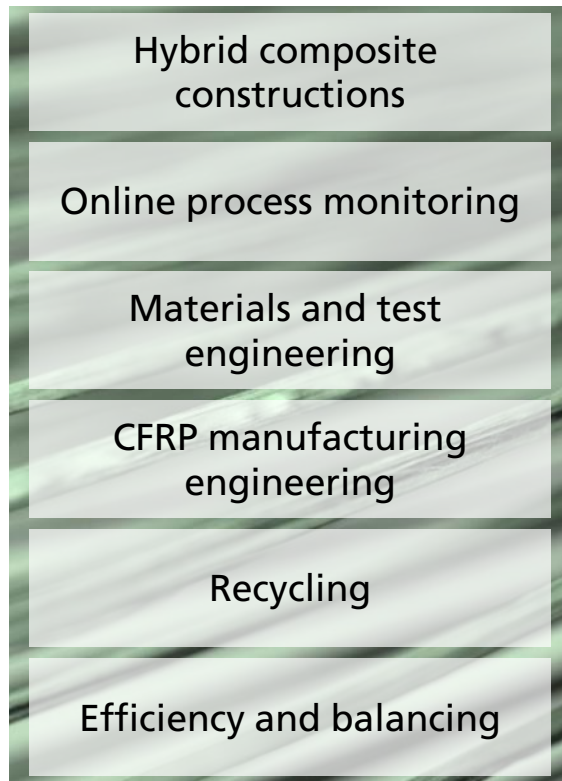
Fraunhofer IGCV

We use synergies in these fields of research and development:

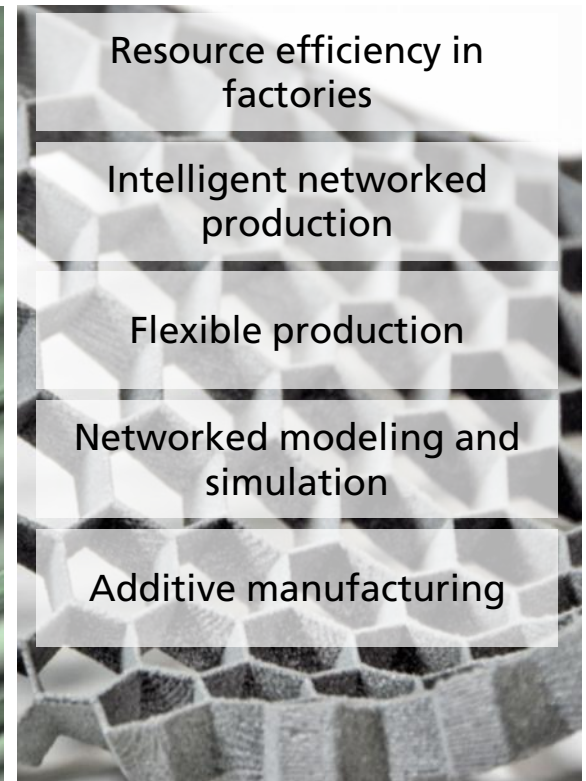
Casting technology



Composite technology

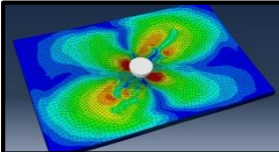


Processing technology

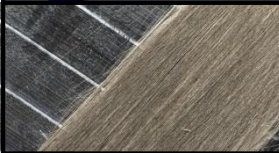


Departments

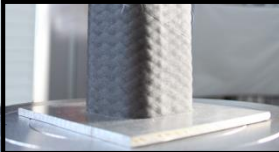
Fraunhofer IGCV – Composite Technology



Simulation



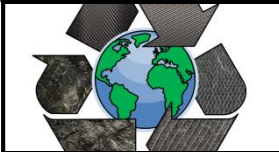
Online-Prozess-Monitoring



Material and Testing



CFK-Processing



Recycling of Composites



Efficiency and Balancing

Services

Our range of services

Improving products and processes

Improved performance | cost efficiency

Developing products

Prototypes | small batches |
manufacturing processes

Consulting on innovations

Market, trend and profitability
analyses | feasibility studies

Introducing new technologies

From TRL 1 to product qualification

Providing licenses

Preliminary research | transfer of
inventions to licenses

Optimizing organizational forms

Identifying and realizing potentials |
generating innovations

Characterizing and testing

High-quality equipment | test reports
and certificates

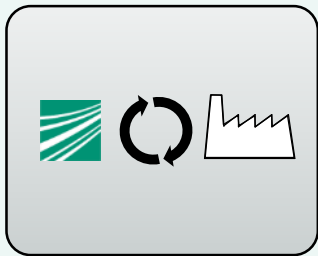
Qualifying for the future

Passing know-how to expert and
executive staff | training

Possibilities for cooperation

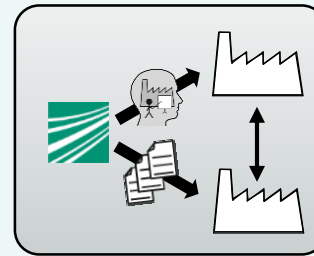
How to cooperate with us?

Bilateral industry projects and FhG model



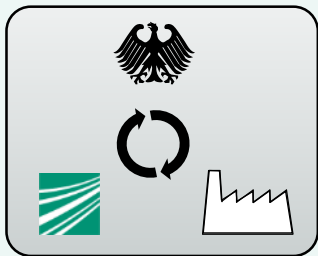
- Individual project definition
- Short to medium-term contract research
- 3-year cooperation, FhG employees work at the client on site

Joint industry projects



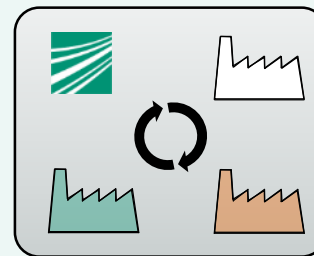
- Complementary partners (e.g. user and supplier)
- Using the methods and competences

Publicly funded projects



- Cooperation of partners from research and industry
- Medium and long-term research projects

Industrial joint ventures



- Joint development of solutions in a low-competition environment
- Long-term projects

▶ Contact us for more information about different funding possibilities/models of cooperation!

Recycling of CFRP – Chance or Restriction?

Thank you very much

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Federal Ministry
of Education
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The Federal Ministry of Education and Research

Our Partners from Europe that are presenting with us

Our partners from Asia that helped us with the organisation
where first collaborations could already be initiated

And last not least: thank you for your attention!



Sustainability is nothing
that falls from the sky and
hits you unprepared!



ELG Carbon Fibre Ltd.
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Composite Cluster Singapore



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Contact us

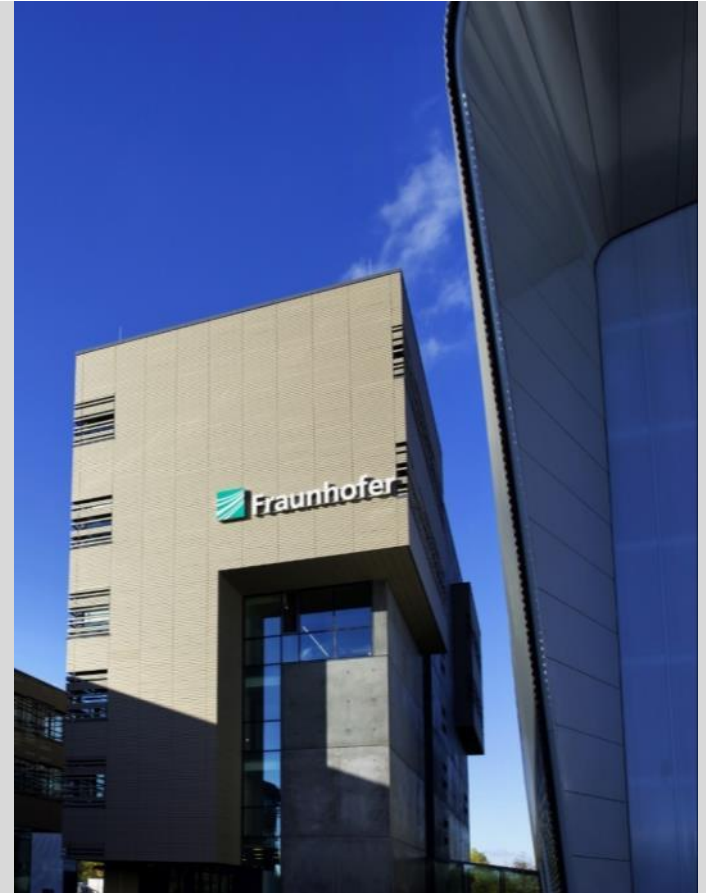
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