Brightlands Materials Center

Bezoek KIVI

Koen Janssen, Marieke Havermans, Richard Janssen, Eugène Veerkamp

6.2.2023

KIVI Engineering Society

Programma

13:00h - 13:30h	Aankomst Chemelot Campus	
13:30h - 14:00h	Ontvangst met koffie en vlaai in het Center Court, Pellinore	
14.00h - 14:40h	Inleiding BMC door	Koen Janssen : Directeur BMC Eugène Veerkamp : Sustainable Buildings Marieke Havermans : Circular Packaging Richard Janssen : Sustainable Mobility
14:40h - 16:00h	Bezoek aan de onderzoek laboratoria, gebouwen 24 en 220 Groep 1 : eerst naar gebouw 24 (Marieke Havermans) Groep 2 : eerst naar gebouw 220 (Richard Janssen en Eugène Veerkamp)	
16:00h - 16:30h	Vragen, napraten en afsluiting	

Brightlands Chemelot Campus (2012-2021)

10 years of pioneering in developing an attractive innovation ecosystem

Triple Helix:
Province of Limburg – Maastricht University – DSM

Results of 10 years development:
- 110+ organisations
- 3.000 jobs
- 1.250 students

Well developed chemistry, materials and biomedical ecosystems

Proud Member of: Brightlands · Chemelot Circular Hub · chemelot for today's future

Three attractive and highly connected innovation ecosystems

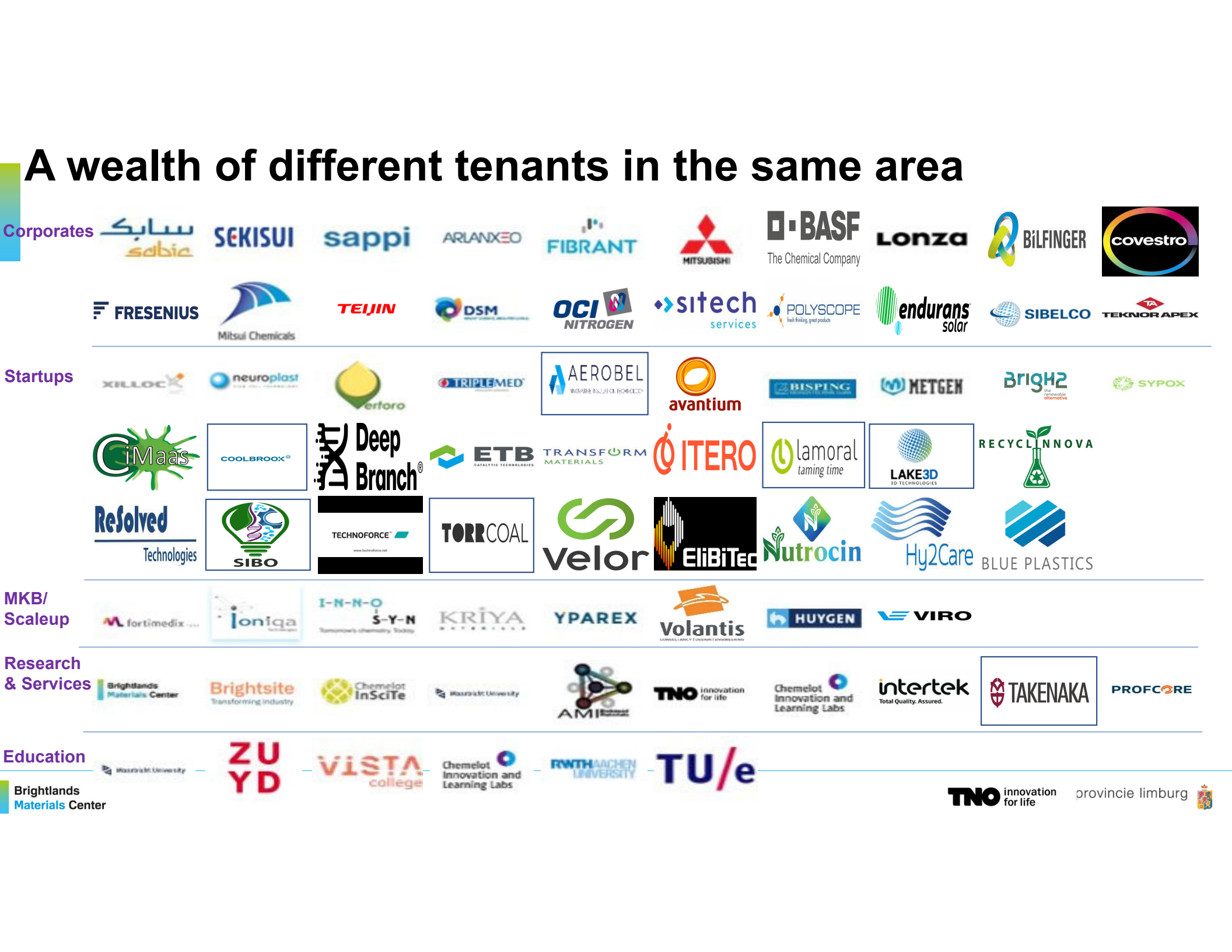
Ecosystem

- R&D organisations
- Joint Development Programs (PPP)
- Infrastructure
- Entrepreneurship (startups)
- Human Capital
- Community Building
- Events

Value Proposition

Accelerating Innovation

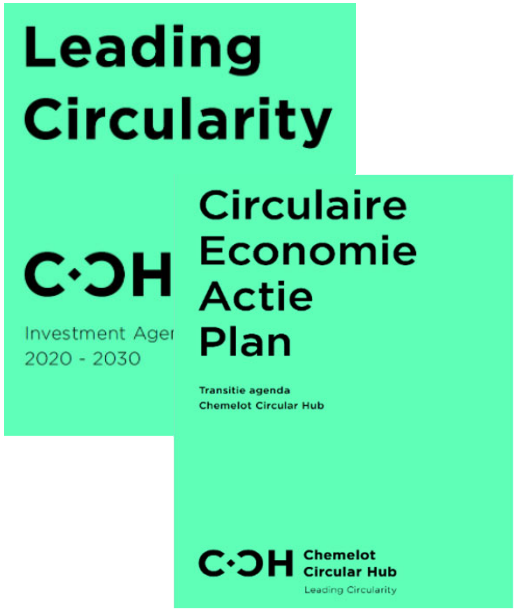
A wealth of different tenants in the same area



Brightlands Circular Space

BCC's
Center of Excellence Circularity
Ecosystem Development

Chemelot Circular Hub &
Circular Economy Action Plan

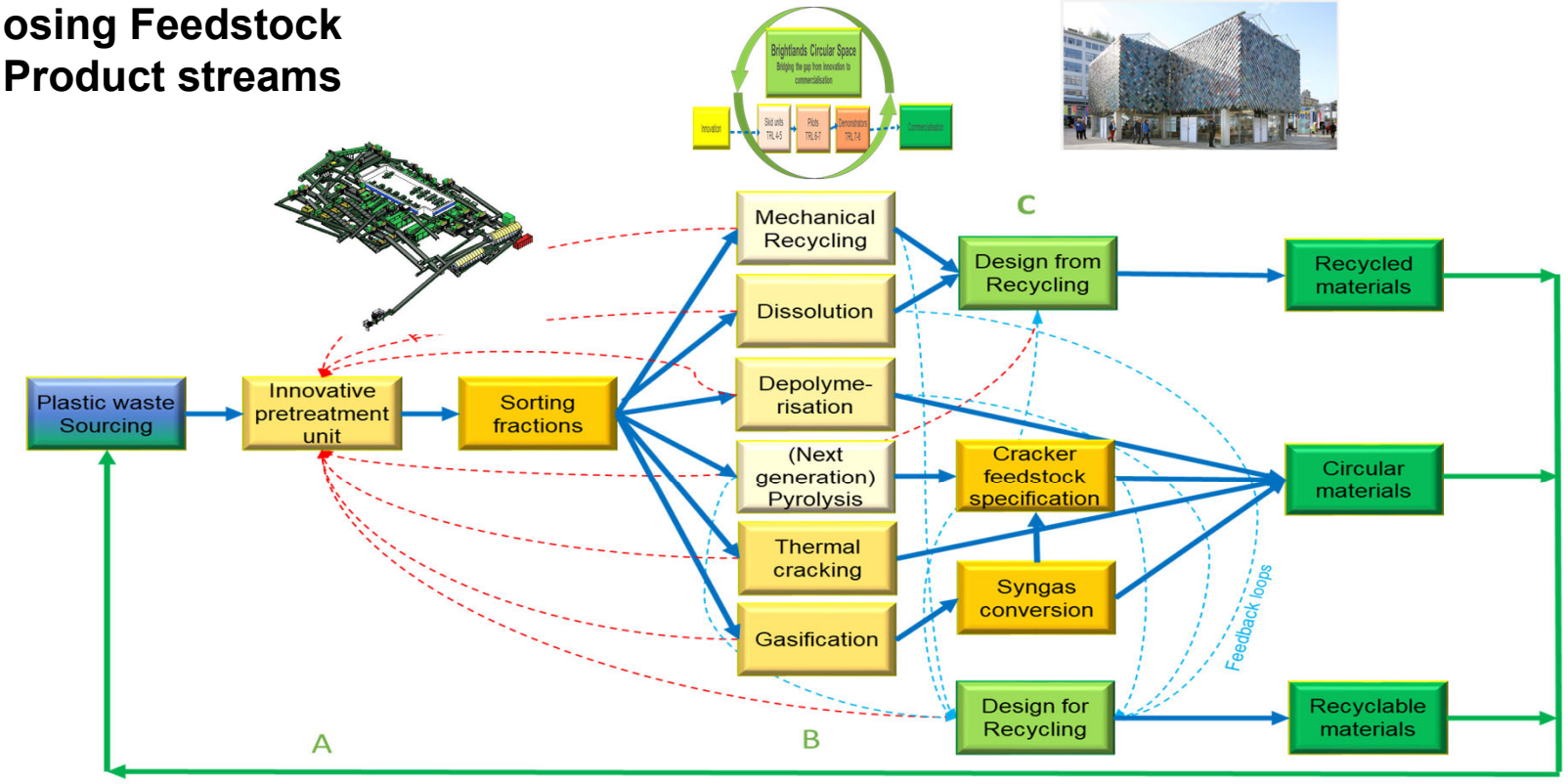


Brightlands Circular Space

sabic
TNO
Maastricht University
Brightlands

Brightlands Circular Space: closing the cycle

Closing Feedstock & Product streams



Skid/pilots/demo's

Waste Processing ***Polymer Processing***

Introduction

Brightlands Materials Center

- Independent R&D Center in the field of polymeric materials
- Established in March 2015 by TNO and the Province of Limburg
- One of TNO's "Joint Innovation Centers"
- Located at the Brightlands Chemelot Campus in the south of the Netherlands

Main lines of thinking

Sustainability

Design from recycle

Material efficiency

Design to recycle

Energy efficiency

Circularity

SUSTAINABLE BUILDINGS at BRIGHTLANDS MATERIALS CENTER

Our Vision and R&D Objectives

“Developing innovative optical materials for building skins will decrease the energy consumption of buildings”

Innovative materials play a key role in determining the level of comfort, natural lighting, ventilation, energy consumption for heating & cooling and CO_2 reduction

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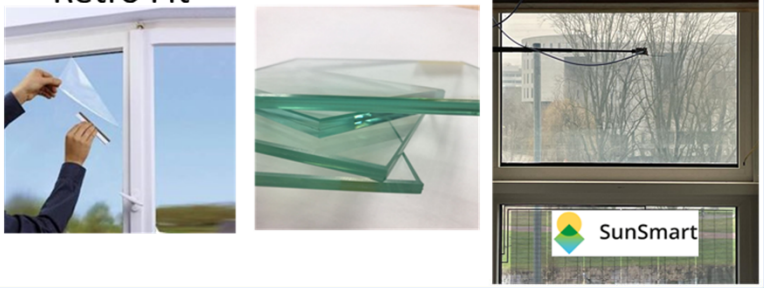
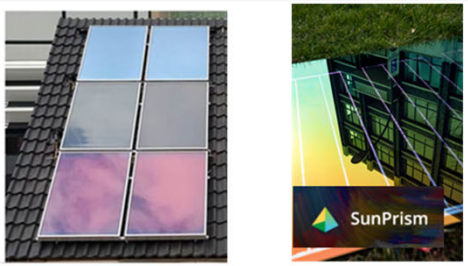
Scope of Sustainable Buildings

Expertise and applications

applications \ expertise	solution processed optical coatings	Nanocomposite optical polymer films
energy efficient windows	SunSmart	Retro Fit, Laminated, SunSmart
BIPV	SunPrism	SunECap, HEAT BLOCKING ENCAPSULANT Enhancing PV Lifetime and Power Output

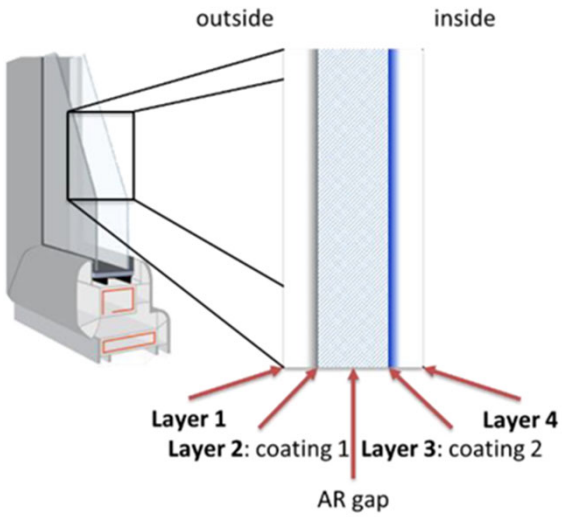




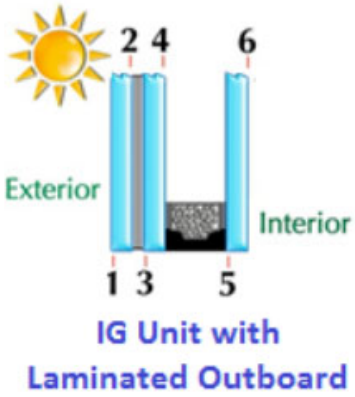
Scope of Sustainable Buildings

Working method of SunSmart

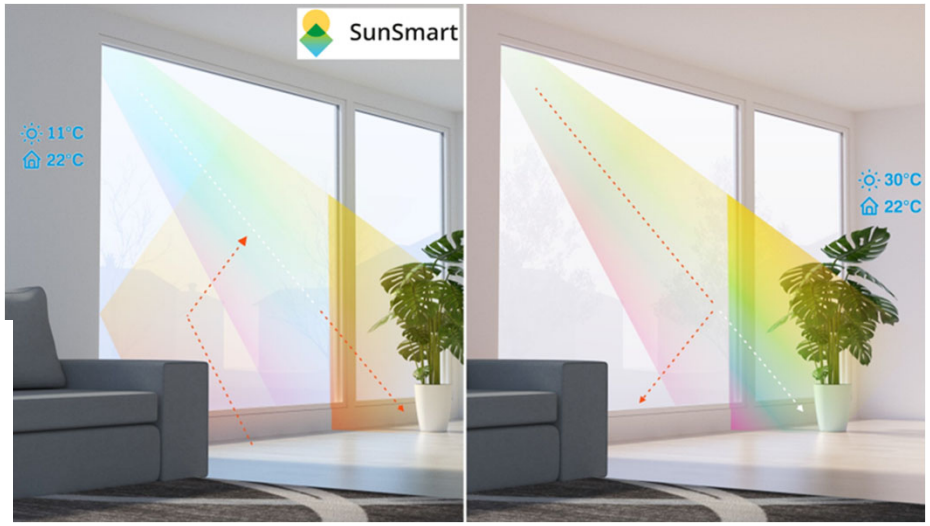
SunSmart setup



Coating 1 = Thermochromic coating
Coating 2 = Low-E coating

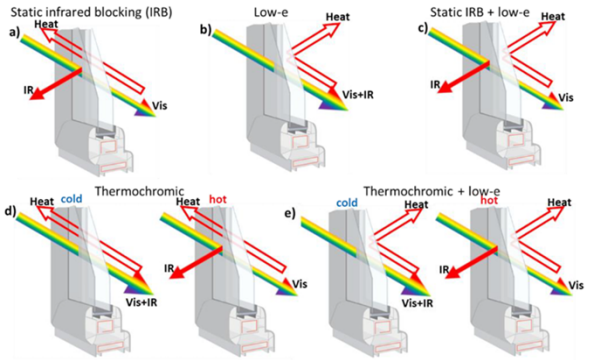


Thermochromic pigment in laminated PVB interlayer



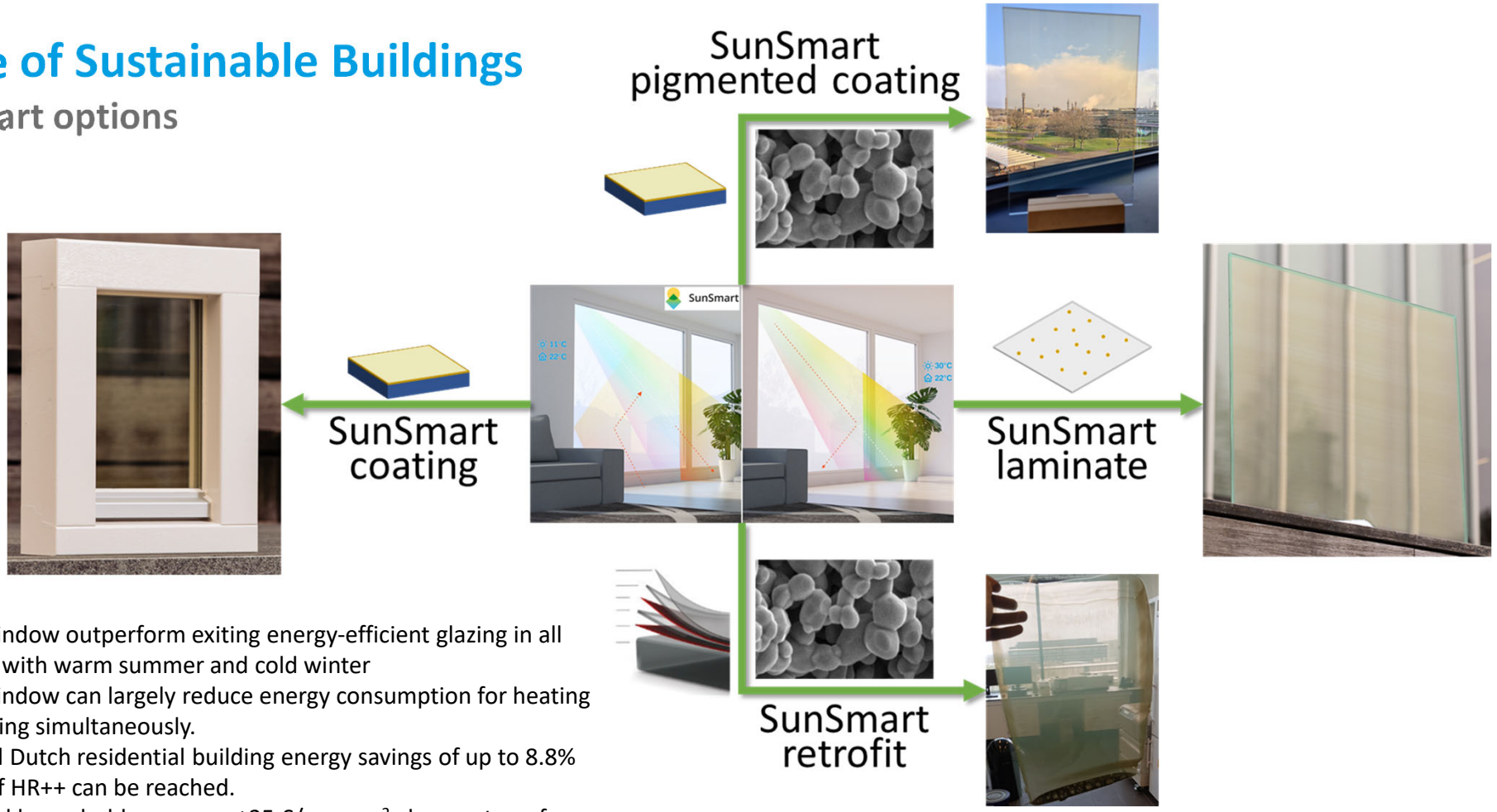
Cold T : Transparent for visible light and heat radiation
Low-E coatings reflects radiator heat

HOT T : Transparent for visible light but blocking heat radiation



Scope of Sustainable Buildings

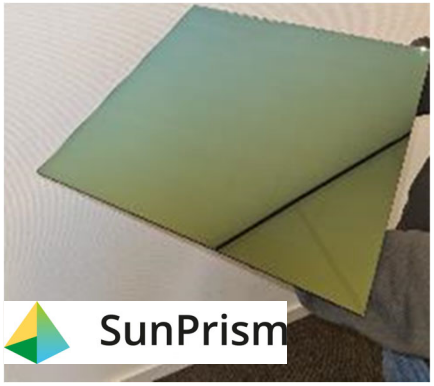
SunSmart options



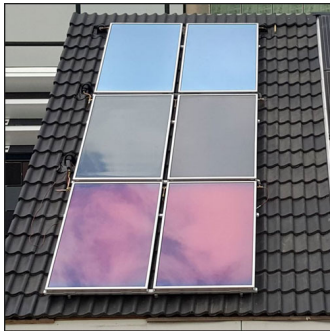
- Smart window outperform exiting energy-efficient glazing in all climates with warm summer and cold winter
- Smart window can largely reduce energy consumption for heating and cooling simultaneously.
- In typical Dutch residential building energy savings of up to 8.8% on top of HR++ can be reached.
- Individual households can save ±25 €/a per m^2 glass on top of savings of current HR++ glazing.

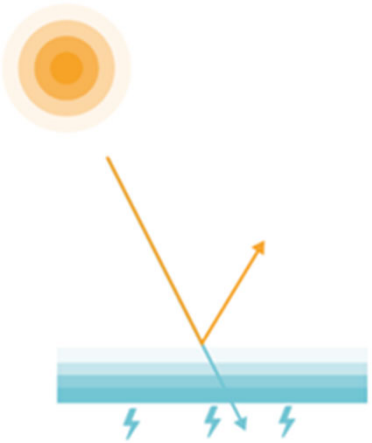
Scope of Sustainable Buildings

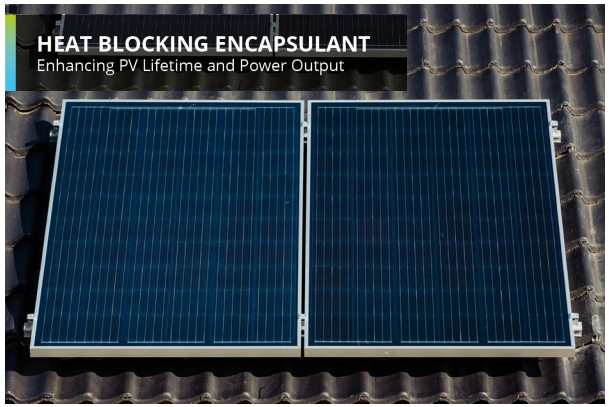
Other development topics



- Colored coating for (BI)PV products.
- Combining bright colors with high cell efficiency.
- Color can be adjusted in a wide range and tailored to desired hue.
- By covering buzz bars with black paint, the solar panel can be made invisible.
- Pilot testing completed.
- 300 m^2 demo in preparation.







- Functional encapsulant for reduced operating temperature in (BI)PV.
- Encapsulant blocks sub-bandgap (> 1100 nm) radiation from entering solar panel.
- Reducing operating temperature can increase power output (0.45% per °C).
- Module damage due to extremely high temperature (> 80°C) can be prevented.
- Pilot testing finished → data analysing.
- Demonstrated on full sized standard panels, BIPV façade elements and PV windows.

Circular Packaging program

Circular Packaging:
Design for recycling,
Design from recycling

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Need for change

Some figures for Europe

- 60 MTons of plastic production
  - 26 MTons used for packaging
    - 16 MTons of plastic packaging waste
    - 40% collected and sorted

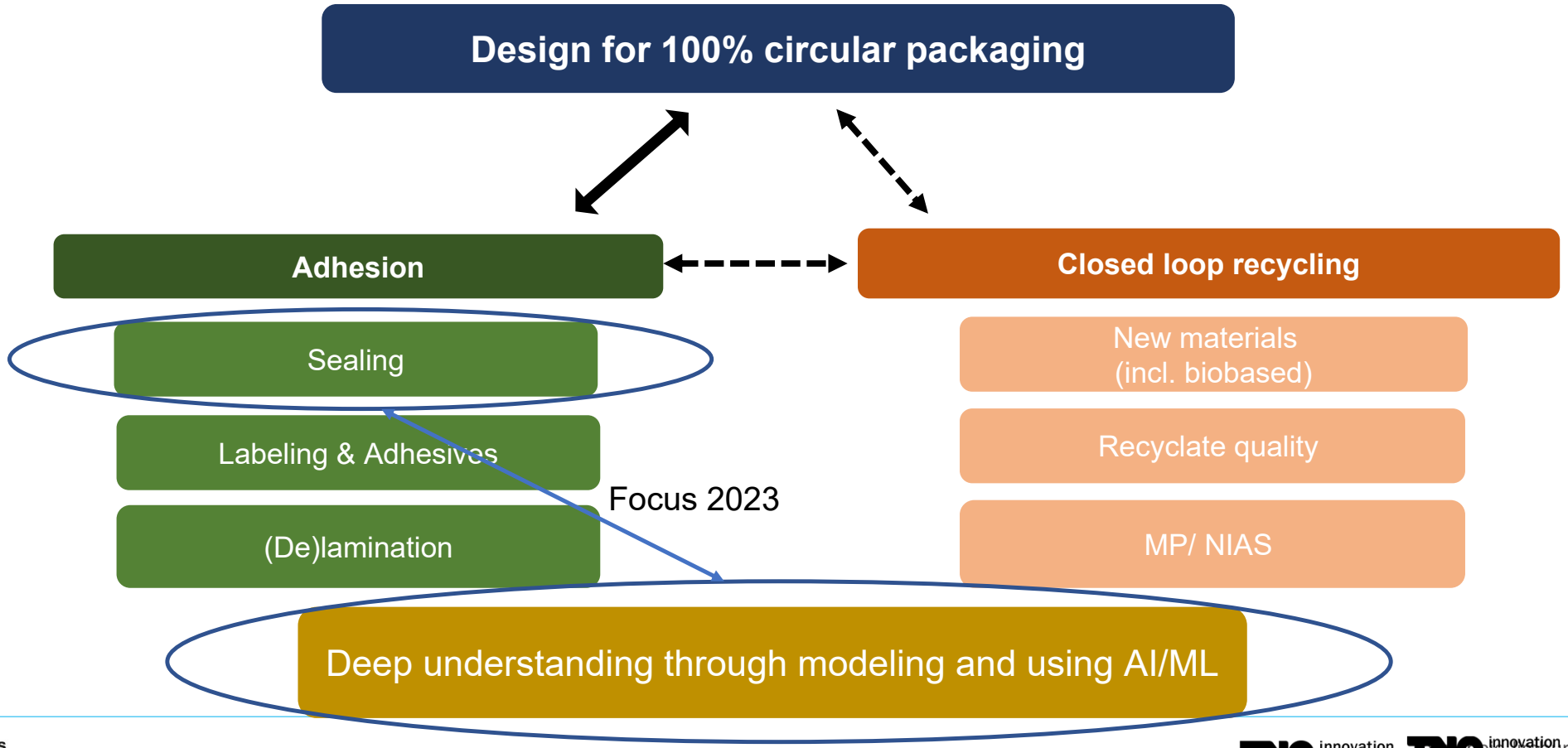
WHY BMC-CP

European regulations set an URGENT NEED to make plastic packaging circular:

- Packaging must be 100% recyclable by **2025** (where possible and stated)
  - ➔ By using monomaterial packaging, sealing window will be reduced and optimised and/or new sealing processes will be required.
- Recycling at scale for food packaging must be demonstrated by **2035**: collected, sorted, and recycled covering at least 75% of EU population including for exported waste.
  - ➔ Switch to circular/recyclable monomaterial packaging designs and new sealing materials and processes will be required
- Packaging must be 100% circular by **2050**
  - ➔ Recyclate use in packaging (>50% by **2040**), causes sealing issues and variations to the sealing process due to quality fluctuations and also influences the formation of microplastics

EUROPEAN PLASTICS PACT

BMC-CP STRATEGY / FOCUS 2023 - 2030



Single use packaging

	RIGID	FLEXIBLE
FOOD	Containers (trays, cups, pots,…)  *3MTon/yr*	Multimaterial laminates  *2MTon/yr*
NON-FOOD	Blown moulded packagings  *1MTon/yr*	Consumer packaging  *1.5Mton/yr*

Brightlands
Materials Center

Brightlands Materials Center

Sustainable Mobility Program

2023

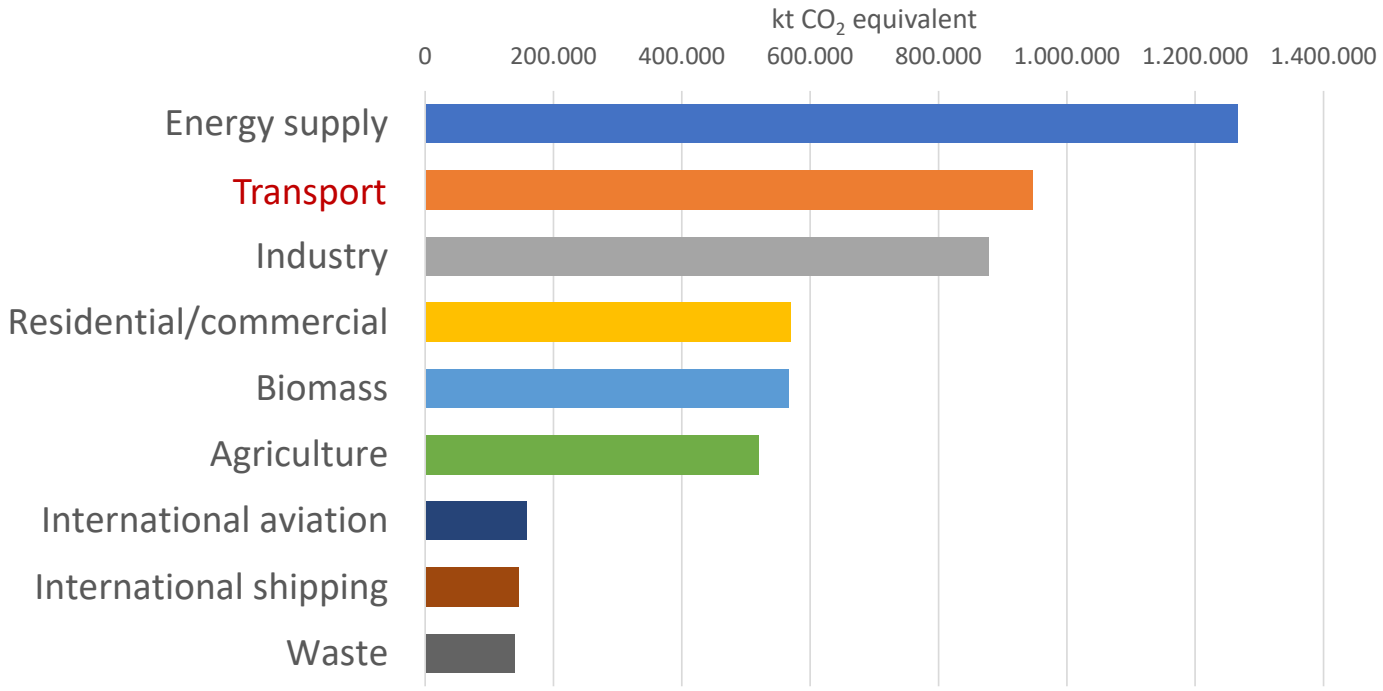
supporting industrial innovation by applied research

Collaborations in (Funded[*1]) Consortia

Bilateral Contract Research

Next Generation of Talent

Transport of people and goods is the 2nd largest contributor to CO_2 emissions in Europe



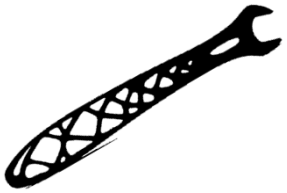
Source: European Environment Agency (EEA)

Development of thermoplastic composites technology for the mobility sector

Accelerating the Material and Energy Transition

Recycling of Thermoplastic Composites

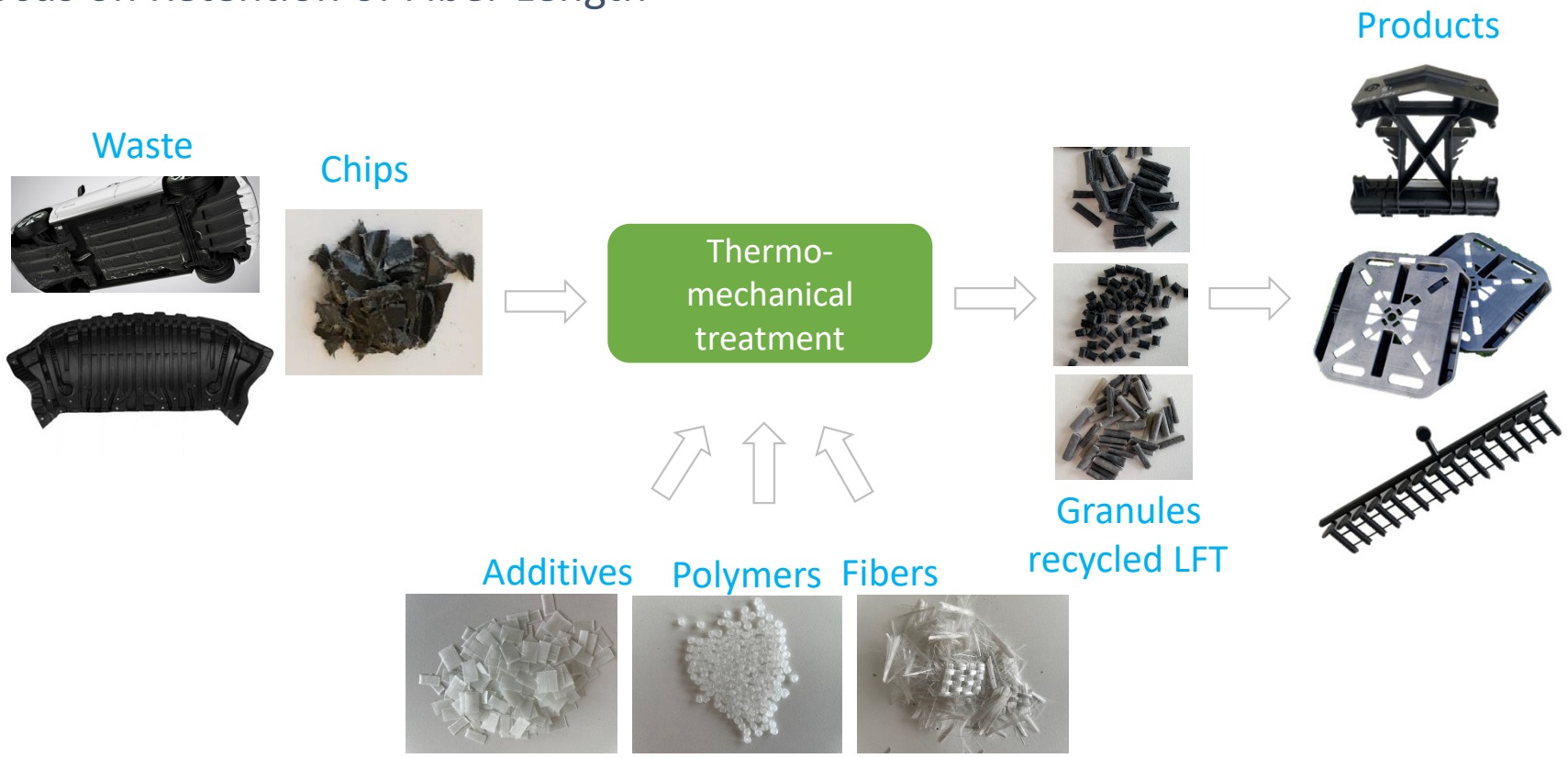
Lightweighting of Structural Components



Weight reduction by (1) metal replacement by composites and by (2) shape optimization

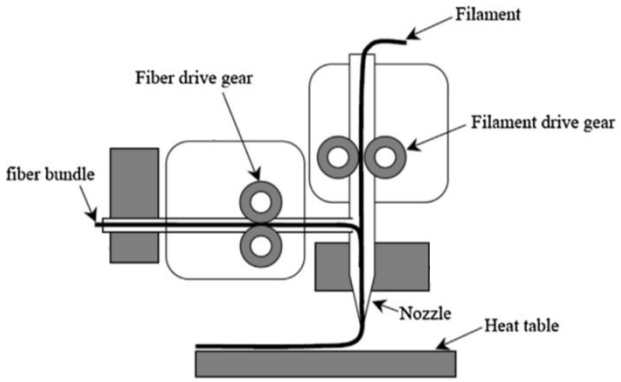
recycling of thermoplastic composites

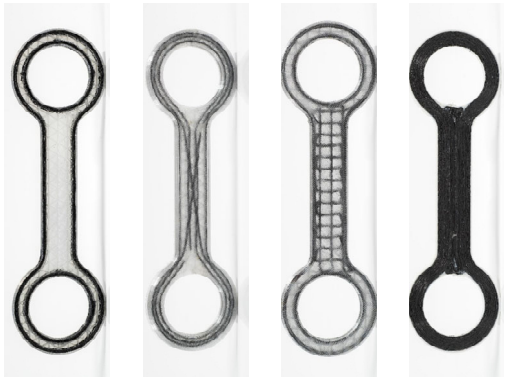
Focus on Retention of Fiber Length



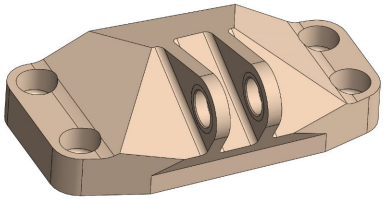
structural, lightweight and freeform components

Continuous Fiber Additive Manufacturing



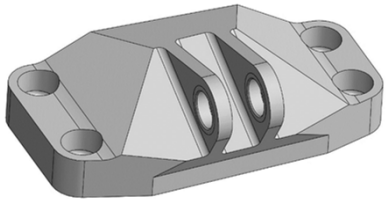


Traditional metal bracket



Relative weight 100%
Strength/weight 100%

Composite bracket



Relative weight ~40-50%
Strength/weight 200-250%

Topology optimization

Relative weight ~35-40%
Strength/weight 250-300%

Composite lightweight design

Relative weight ~20-30%
Strength/weight 350-500%

examples of our projects

100% Limburg Bike
Composite bike frame lugs for lightweight sports bikes

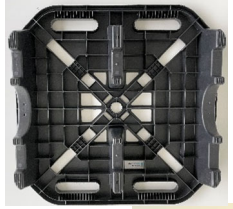
Bright Smart Scoliosis Brace
Comfortable customer specific biomedical brace by composite additive manufacturing

FITED
You are the design.

Support Dutch Defense
Spare parts and tools manufacturing on location

Fieldlab Thermoplastic Composites Recycling
Recycling of automotive splash shields into recycled thermoplastic composites

Recycled Thermoplastic Composites
Product and application development



Wind turbine blade recycling
Development of thermoplastic composite material from recovered wind turbine glass fibers

our current focus: grow number of use cases with partners

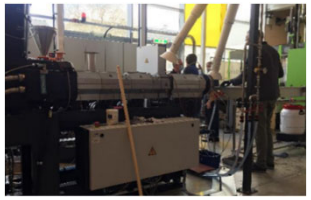
Further develop unique lightweighting technologies and next level (more complex) demonstrators in close collaboration with the mobility industry

Set up mobility business chain collaborations to further develop our recycling technology and demonstrate feasibility of re-LFT product in use-cases

Technology propositions

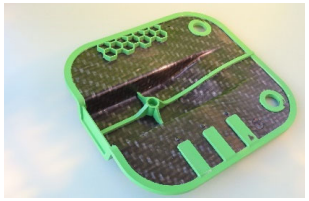
Sustainable and Circular Solutions with Thermoplastic Composites

- Recycling technology for thermoplastic composites



- Recycled Long Fiber Thermoplastic (re-LFT) product development for injection molding applications

- Innovative hybrid composites



- Lightweight structural components with Continuous Fiber Additive Manufacturing

- Material development for Continuous Fiber Additive Manufacturing