



Amsterdam University
of Applied Sciences

DESIGNING with ALTERNATIVE MATERIALS

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Onderzoeksprogramma Urban Technology



Amsterdam University
of Applied Sciences

Faculty of Technology

6 professors

45fte researchers

4000 students

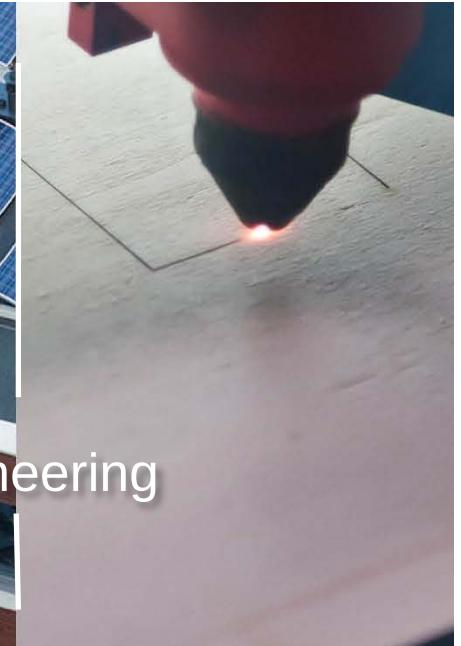
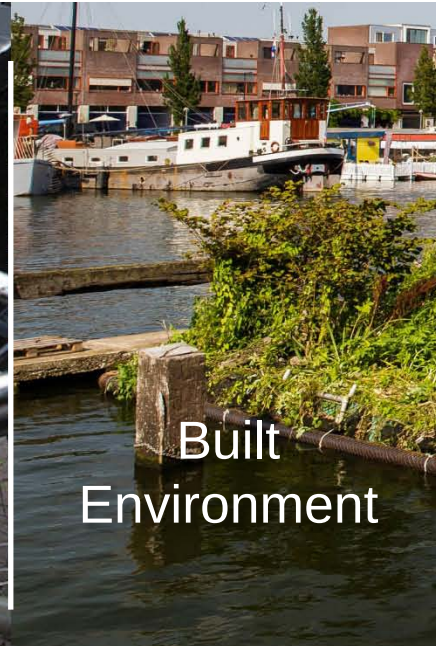
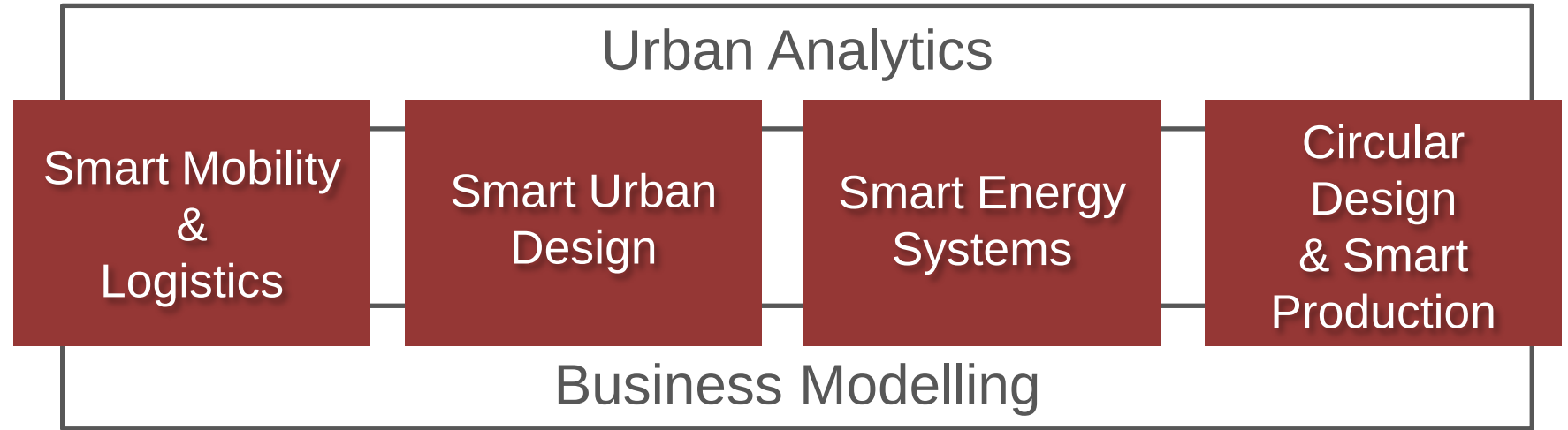
RESEARCH PROGRAMME URBAN TECHNOLOGY

SOLUTIONS FOR A SUSTAINABLE, LIVABLE AND CONNECTED CITY



Applied research
for smart technological solutions for the city

- **Research, design, prototyping and implementation**
- **Metropole amsterdam is our field lab** where solutions are realised and tested
- Together with **companies, organisations and knowledge partners**





Urban Technology

Smart Mobility
&
Logistics

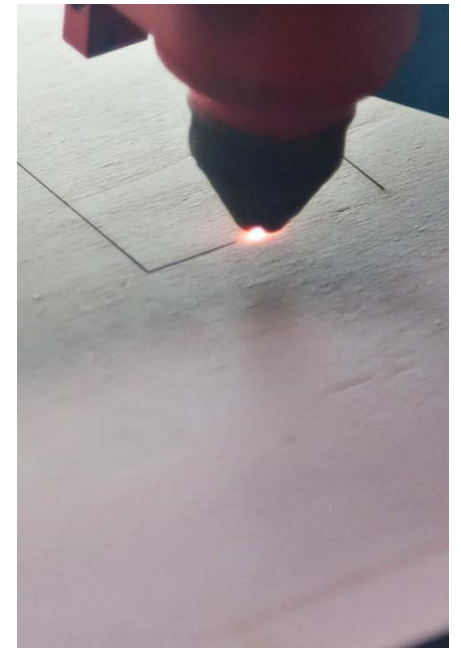
Smart Urban
Design

Smart Energy
Systems

Circular
Design and
Smart
Production

Research and design for a circular city

- Circular products based on renewable materials and waste streams
- Closing material loops locally, e.g. organic waste in urban farming initiatives
- Design and production with flexible and digital production techniques, e.g. 3D printing
- Circular business models





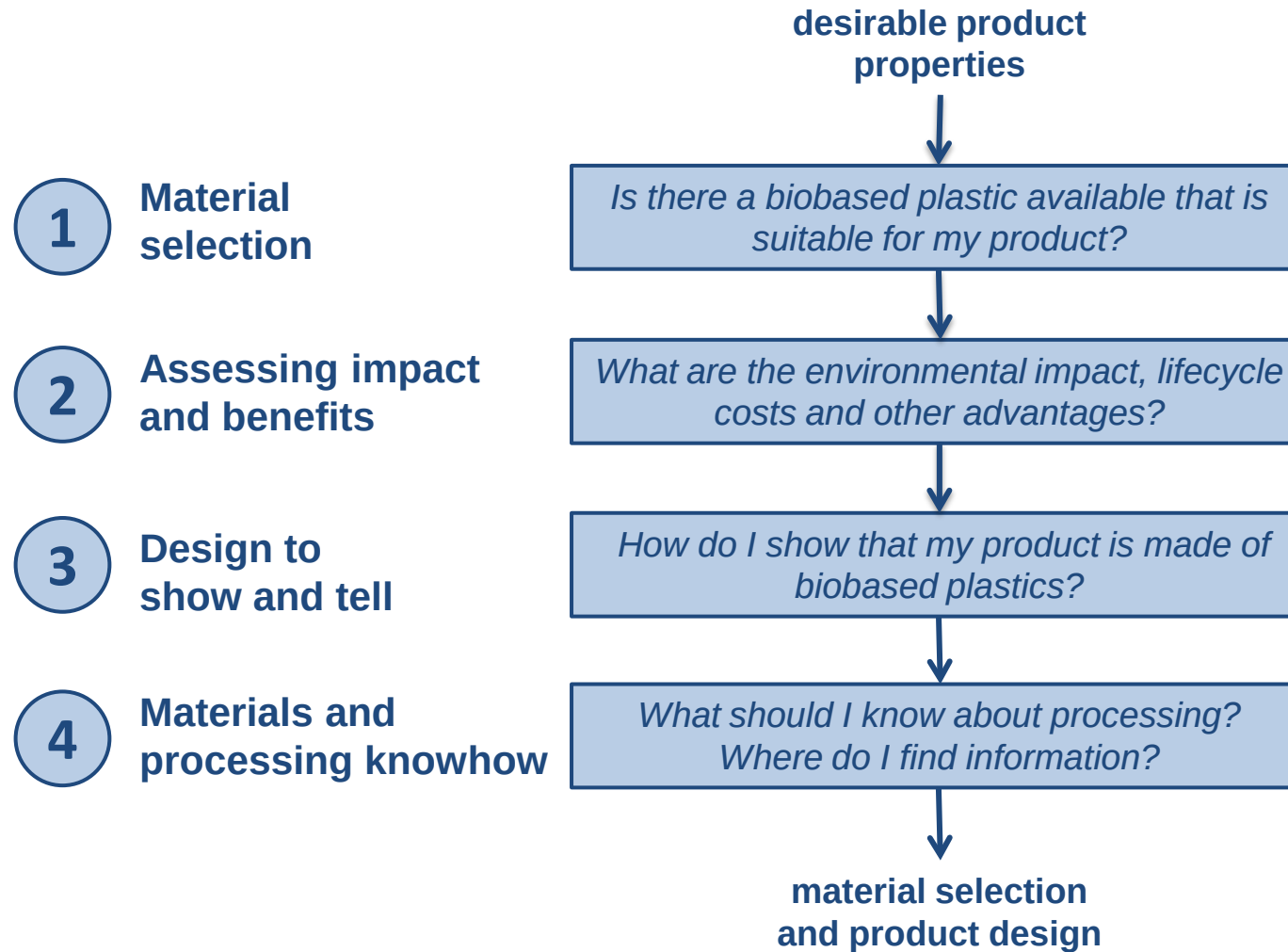
Research project
(2013-2015)
in cooperation with:



Supported by:



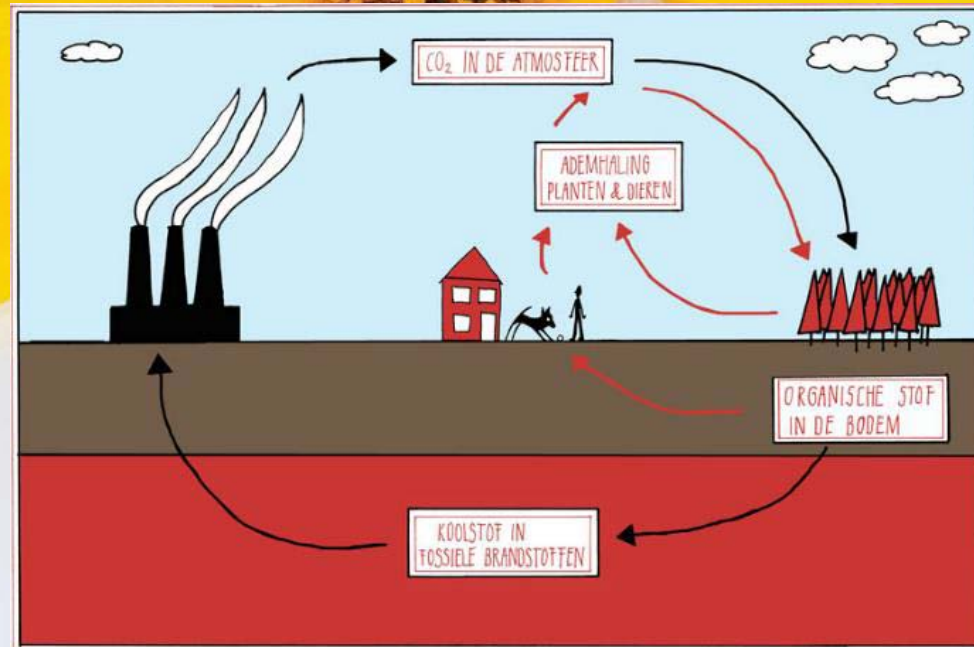
DESIGN CHALLENGES WITH BIOBASED PLASTICS





WHAT YOU SHOULD KNOW ABOUT BIOBASED PLASTICS

*Biobased plastics
are (partly) made
of raw materials
from natural and
renewable sources*



A GEHALTE HERWINBARE GRONDSTOF			
20-40% BIOBASED			80-60% P.CHEM.
40-60% BIOBASED			60-40% P.CHEM.
60-80% BIOBASED			40-20% P.CHEM.
>80% BIOBASED			<20% P.CHEM.



*Biobased plastics
are sometimes
biodegradable,
but not always!*



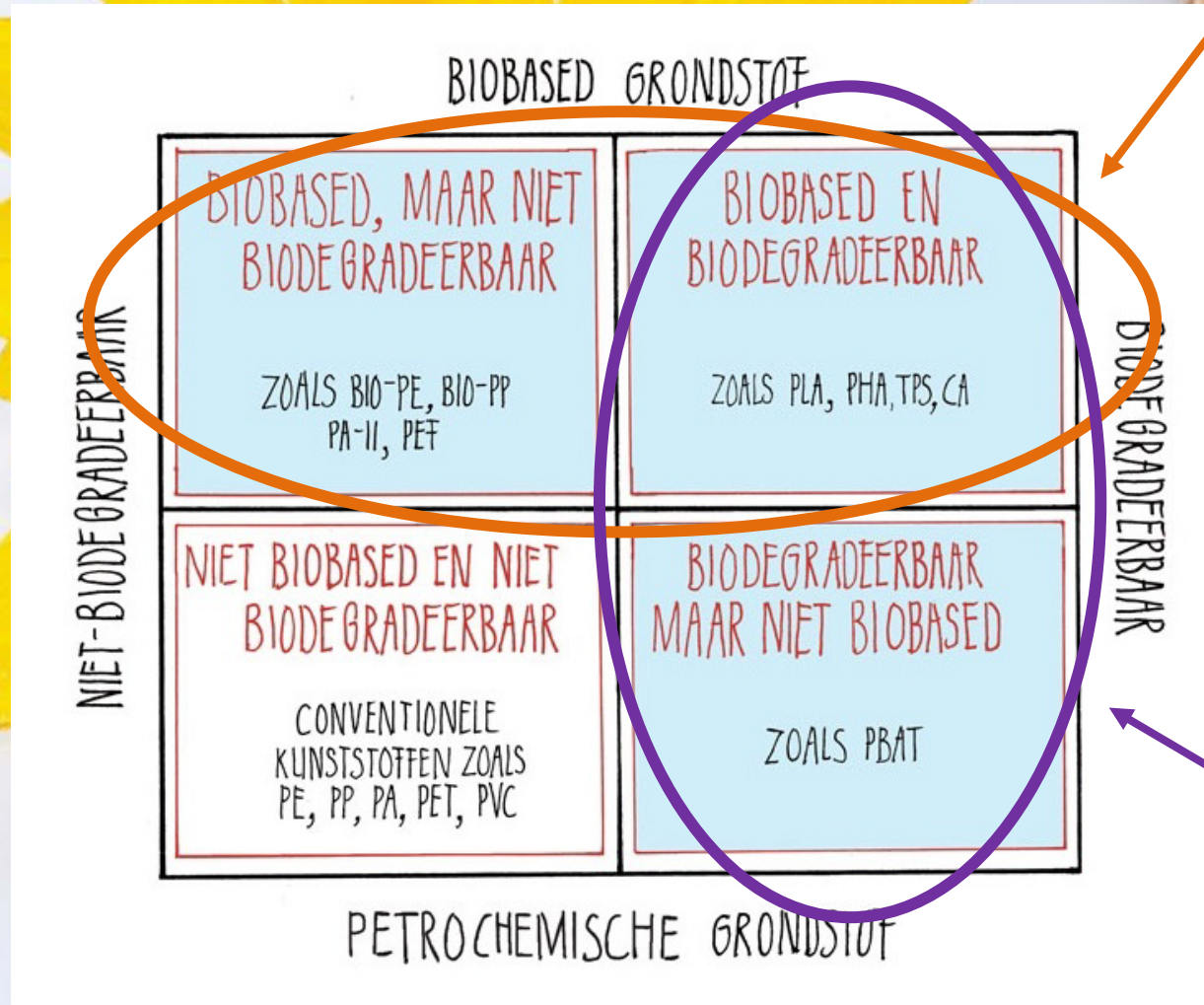
Source: www.theinnovationdiaries.com

NIET BIODEGRADEERBAAR	COMPOSTEERBAAR	IN DE GROND BIODEGRADEERBAAR	IN WATER BIODEGRADEERBAAR																
• PA-11 • PET • bioPET • bioPE • bioPP	• PLA • PHA • TPS • CA • PBAT	• PHA • TPS • PBAT	• PHA • TPS																
<table><tr><td>B</td><td><u>BIO</u> <u>DEGRADEER</u> <u>BAAR</u></td><td><u>COMPOST</u> <u>EERBAAR</u> (THUIS)</td><td><u>COMPOST</u> <u>EERBAAR</u> (INDUSTRIEEL)</td></tr><tr><td>SOIL</td><td> </td><td> </td><td> </td></tr><tr><td>WATER</td><td> </td><td></td><td></td></tr><tr><td>MARINE</td><td> </td><td></td><td></td></tr></table>				B	<u>BIO</u> <u>DEGRADEER</u> <u>BAAR</u>	<u>COMPOST</u> <u>EERBAAR</u> (THUIS)	<u>COMPOST</u> <u>EERBAAR</u> (INDUSTRIEEL)	SOIL	 	 	 	WATER	 			MARINE	 		
B	<u>BIO</u> <u>DEGRADEER</u> <u>BAAR</u>	<u>COMPOST</u> <u>EERBAAR</u> (THUIS)	<u>COMPOST</u> <u>EERBAAR</u> (INDUSTRIEEL)																
SOIL	 	 	 																
WATER	 																		
MARINE	 																		



*Confusing
terminology:*

*bioplastics
are
biobased plastics
and/or
biodegradable
plastics!*



*biobased
plastics*

*biodegradable
plastics*



APPLICATION AREAS FOR BIOBASED PLASTICS

Disposables: products for one-time use

Planables: products of which the lifetime ends
- or can be ended - at a predefined moment

Durables: products for long-time use



DISPOSABLES

PACKAGING



e.g. yoghurt container for Activia



e.g. compostable bags for bio-waste

CATERING



e.g. compostable cup by BioFutura

HORTICULTURE AND AGRICULTURE



e.g. pots and trays by Desch Plantpak



e.g. mulch film

MEDICINE AND PERSONAL CARE



e.g. biodegradable nappy lining



PLANABLES*



Ground consolidators
for shoreline protection
design by Bureau Witteveen+Bos
source: www.witteveenbos.nl



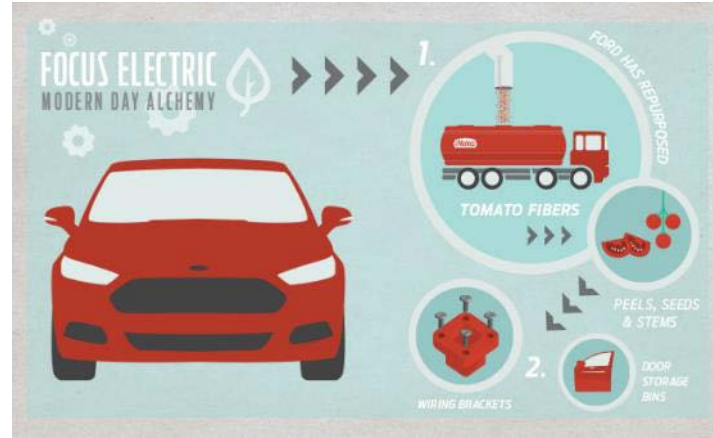
Habitat structure
for recovery of mussel-beds
design by Bureau Waardenburg
source: www.buwa.nl



Keeper system
for planting trees
material (Cradonyl) and design by Natural Plastics
source: www.naturalplastics.nl



DURABLES



AUTOMOTIVE SECTOR

e.g. parts Tom-auto by Ford & Heinz



SPORTS SECTOR

e.g. ski-boot by Salomon



CONSUMER ELECTRONICS

e.g. keyboard by Fujitsu



TEXTILES

e.g. clothing and fabric by Qmilk



OTHER: TOYS, OFFICE SUPPLIES

e.g. toys by BioSerie



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PLANABLE AND DURABLE APPLICATIONS OF BIOBASED PLASTICS AND THEIR PERCEPTION BY DUTCH COMPANIES AND DESIGNERS





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OAT shoes: “shoes that bloom”

Shoes made from biodegradable plastics and other natural materials

source: www.oatshoes.nl

“Shoes that bloom”

biodegradable sneakers
that grow flowers when
you plant them





Zuperzozial Raw Earth collection

Reusable tableware based on corn and bamboo

Design by Remco van der Leij

source: www.zuperzozial.nl



to be used
again and again
and finally
you can
compost it





D-Grade®, Purely Natural from Desch Plantpak

Range of biodegradable thermoform pots, trays, and packs

Material, design and production by Desch Plantpak

source: www.d-grade.nl

100% renewable
100% biodegradable
100% gmo-free





Ecological coffin

Biodegradable coffin made from biobased plastics made from local organic waste

Design by Marieke Havermans

source: www.onora.eu

Traditionele Uitvaartkist

- ☆ Donker
- ☆ Zwaar (gem. 45 kg)
- ☆ Hoge CO2 uitstoot
- ☆ Milieubelastend
- ☆ Standaard vormgeving
- ☆ Per stuk verpakt
- ☆ Hoge verbrandingswaarde (roet)

Ecologische Uitvaartkist

- ★ Frisse kleuren
- ★ Licht (25 kg)
- ★ Biologisch afbreekbaar
- ★ Stijlvolle vormgeving
- ★ Stapelbaar
- ★ Lagere verbrandingswaarde
- ★ Schone verbranding

“from cradle to grave”





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combining
natural fibres of
wool and flax with
biobased plastics

Flax chair

Chair made of flax and PLA composite



Wool and PLA carpet

Carpet made of wool and PLA



Design by Christien Meindertsma in collaboration with fibre specialist Enkev

source: www.labelbreed.nl



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Nockstone

Building blocks for interior products

Design by Melle Koot, Volken de Vlas and Pezy

source: www.nockstone.com

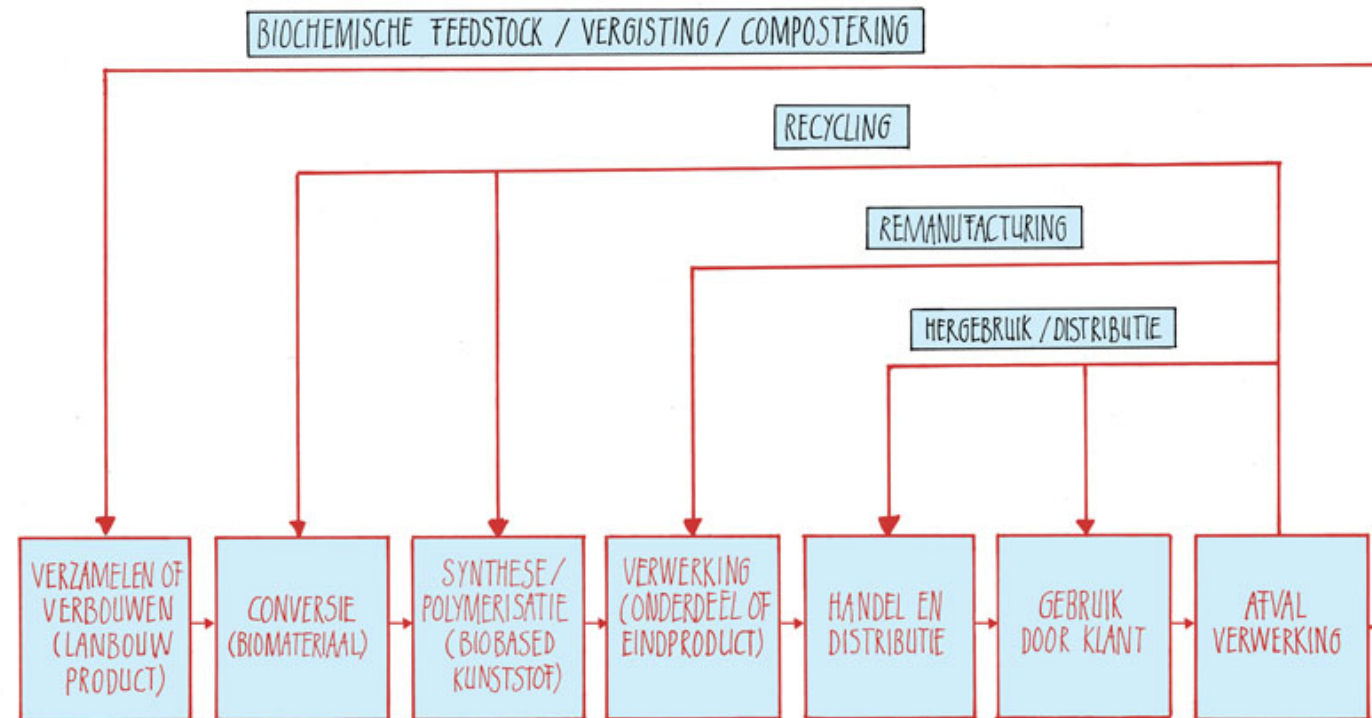
re-usable for
various purposes
and at disposal
the material is
100% recyclable





Research and project results

Based on research questions of SMEs in the biobased plastics value chain:
especially material developers, designers, processors and product producers.





Experimenting with new biobased plastics and new application areas

Exploring material characteristics, production technologies and application areas

By researchers HvA and graduation students Product Design

Glycix

Bioplastic made of glycerin and citric acid
by a spin-off from University of Amsterdam:
www.plantics.nl

Biofoam

A foamed product made from PLA
developed and produced by Synbra Technology bv
www.biofoam.nl

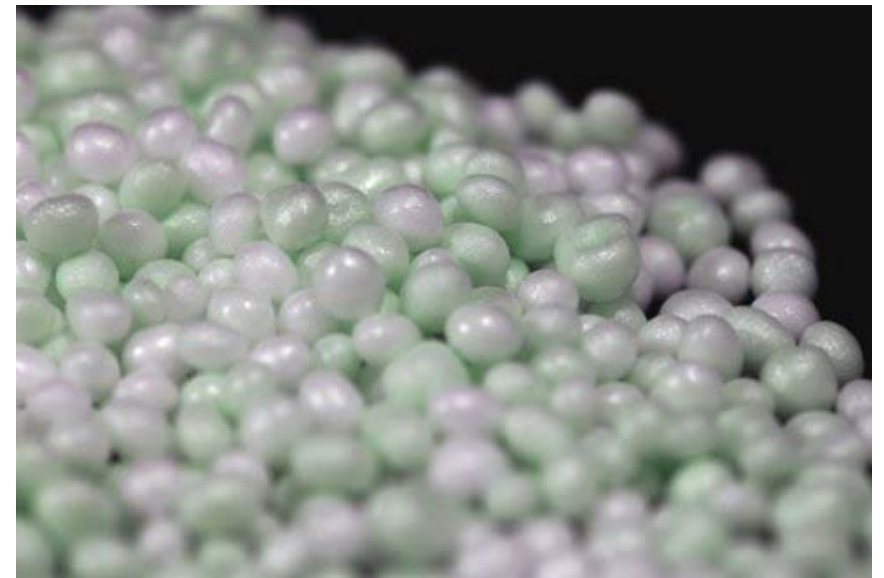
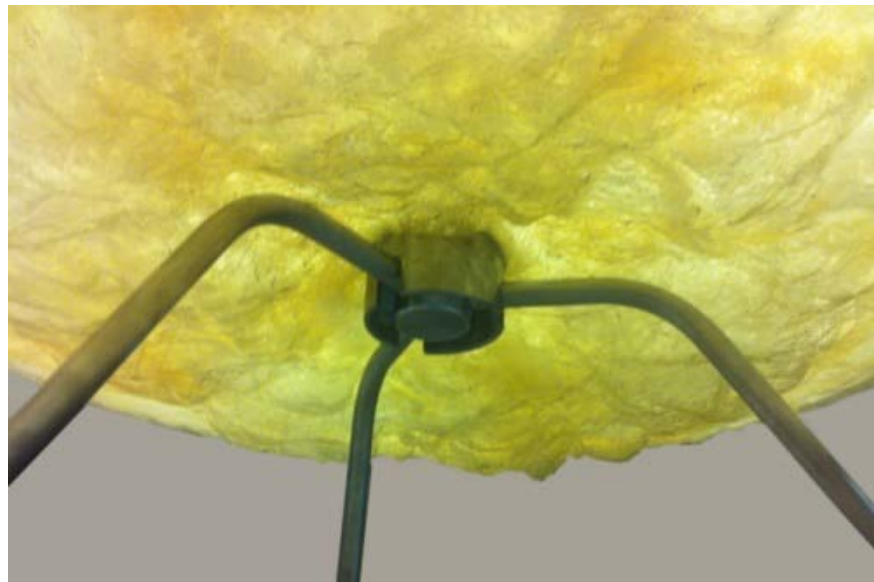
Experimenteren met Plantics
Een nieuw plantaardig

Plantics is plastic, maar dan gemaakt van plantaardige grondstoffen. In tegenstelling tot regulier plastic, is Plantics gebaseerd op een polymer dat volledig gemaakt is van hernieuwbare grondstoffen. Plantics, voorheen Glycix genoemd, is een 100% biologisch afbreekbaar schuimende kunststof gebaseerd op glycerol. Dit is een bioproduct van het biologische productieproces. Hierdoor wordt waarde toegevoegd aan een afvalstroom.

Wim Hegeler van HvA

Over het onderzoek
Dit onderzoek maakt deel uit van het project Design Challenge van HvA en Plantics, waarin is het onderzoek naar nieuwe materialen opgezet van het onderzoek naar biologische productieprocessen. Het project wordt mede gefinancierd door de Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO).

12 • april 2015 • product



Research into the look & feel of biobased plastics

Exploratory sensory research with plastic cups – petrochemical and biobased – and translation into design rules.

Graduation research with honours by Manouk van der Wal, student Product Design



Design rules

A biobased plastic cup should:

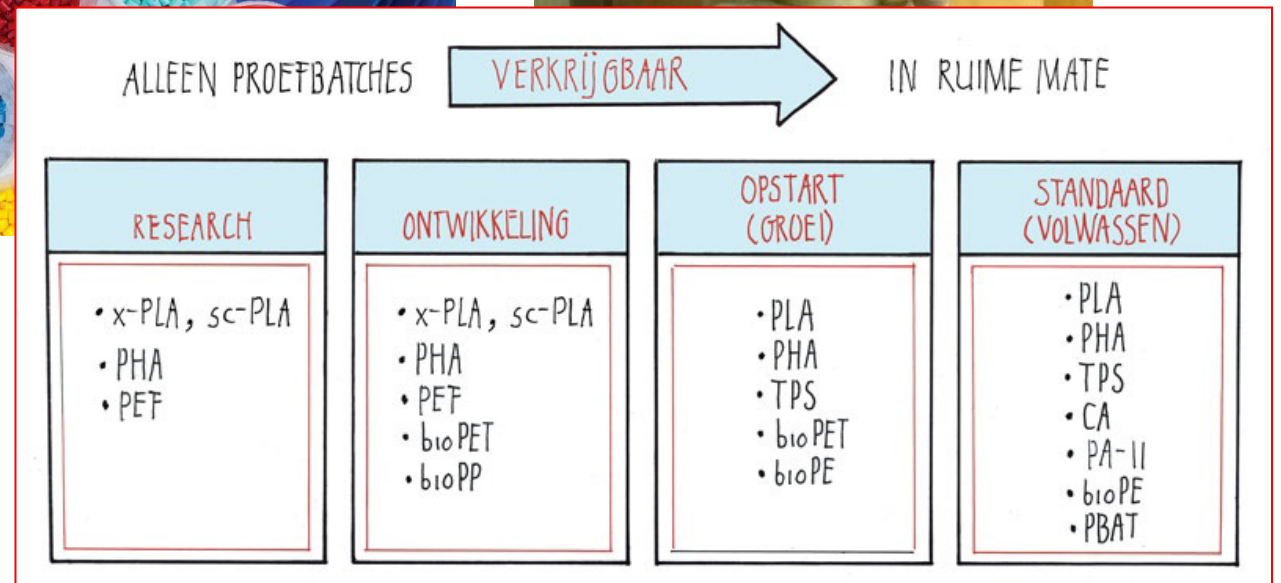
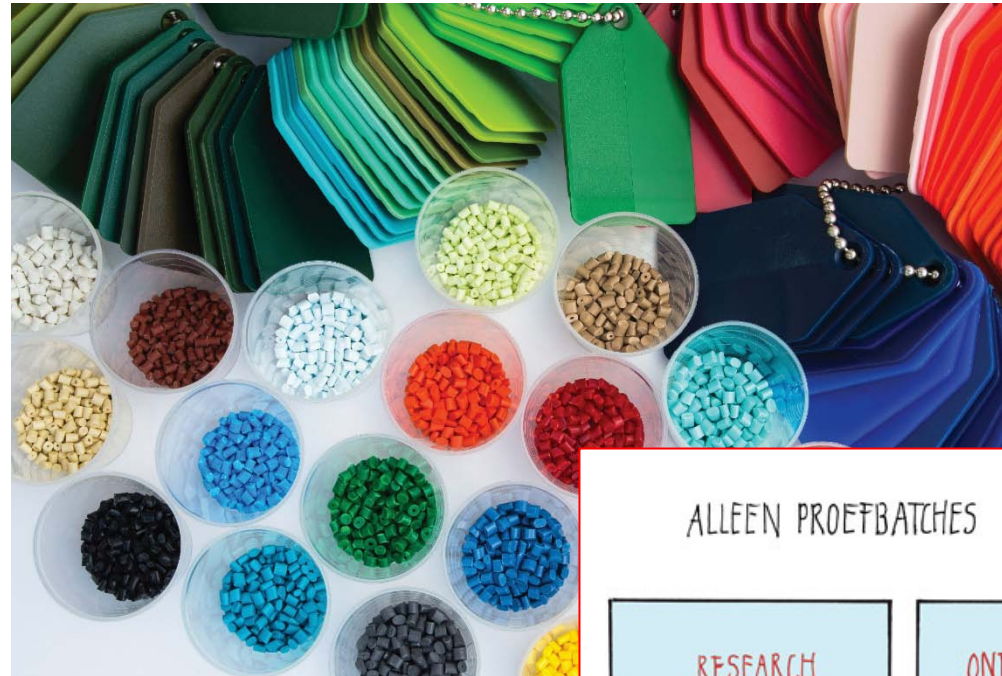
- have no scent or taste
- sound dull and solid and not high, shrill or hard
- have a fibre look and structure
- feel heavy
- have a natural colour, not transparant



Disseminate knowhow on material characteristics, availability and processing techniques

Especially on 3D printing and press technique

Researchers and students HvA together with WUR and TUDelft

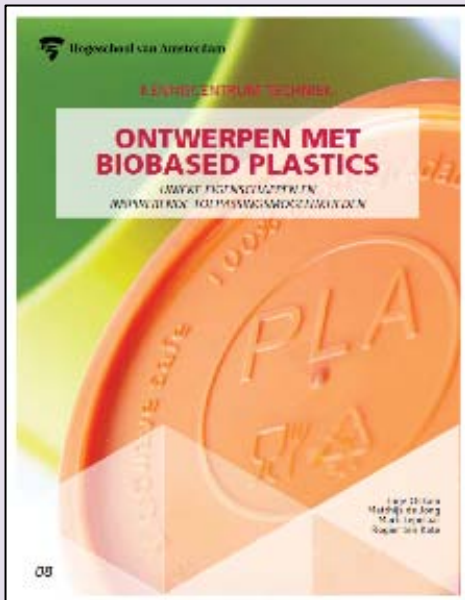




Development of a selection tool for biobased plastics

Development of a selection tool for designers to get a first impression on appropriate bioplastics based on desired product functionality.

By researchers HvA and WUR



	EIGENSCHAP	MOGELIJKE EISEN				
1	% BIOBASED	100%	GEDEELTELIJK	0%		N.V.T.
2	BIODEGRADEER- BAARHEID	NIET	COMPOSTEERBAAR	IN GROND	IN WATER	N.V.T.
3	TEMPERATUUR VORMVASTHEID	< 60%	60-100°C	> 100°C		N.V.T.
4	TRANSPARANTIE	0%	OPAQUE	100%		N.V.T.
5	OPLOSBAARHEID	WATERRESISTENT	WATEROPLOSBAAR			N.V.T.
6	BARRIERE	WATERDAMP	O ₂	CO ₂	UV	N.V.T.
7	TAAIHEID	TAAI	MINDER TAAI			N.V.T.
8	STIJFHEID	STIJF	MINDER STIJF			N.V.T.
9	STERKTE	STERK	MINDER STERK			N.V.T.
10	LEVENSTASE	RESEARCH	ONTWIKKELING	GROEI	VOLWASSEN	N.V.T.
11	MATERIAALKOSTEN	< 2€/KG	2-5€/KG	> 5€/KG		N.V.T.



WHAT ABOUT WASTE MATERIALS?





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Waste Board

Skateboard made of plastic caps, dredged out of the Amsterdam canals.

Material research and prototyping by Engineering students for Plastic Whale.



[HOME](#) [ABOUT](#) [DESIGN](#) [MAKING OF](#) [BOARDS](#) [AMBITION](#) [CONTACT](#)

UNIQUE DESIGNS

Each WasteBoard is entirely unique. That's because they are crafted by hand. The selection of bottle caps is hand picked. With sheer muscle force we press the caps into the mould.

The small imperfections you might discover on each board are no production flaws but signs of our love and dedication to the process. We hope you feel the same.





URBAN FACTORY FROM URBAN WASTE TO CIRCULAR PRODUCTS

van Afval tot Product

Inspirerende cases: ontwerpen met gerecycled materiaal

Publicatie van
Urban Factory:
from Urban Waste to Circular Products

Karina Peña
Maarten Versteeg
Manouk van der Wal

Is a second or third life possible for ...?

- plastic consumer waste
with FabCity and WastedLab
- rubber car tires used as granulate in soccer fields
with Granuband and Joosten Ecodak
- post-consumer plastic waste in 3D printing
with Refilment and CRE8
- used bricks in 3D printing of buildings
with BAM en Universal Architecture
- waste from renovation projects
with Amsterdam Arena

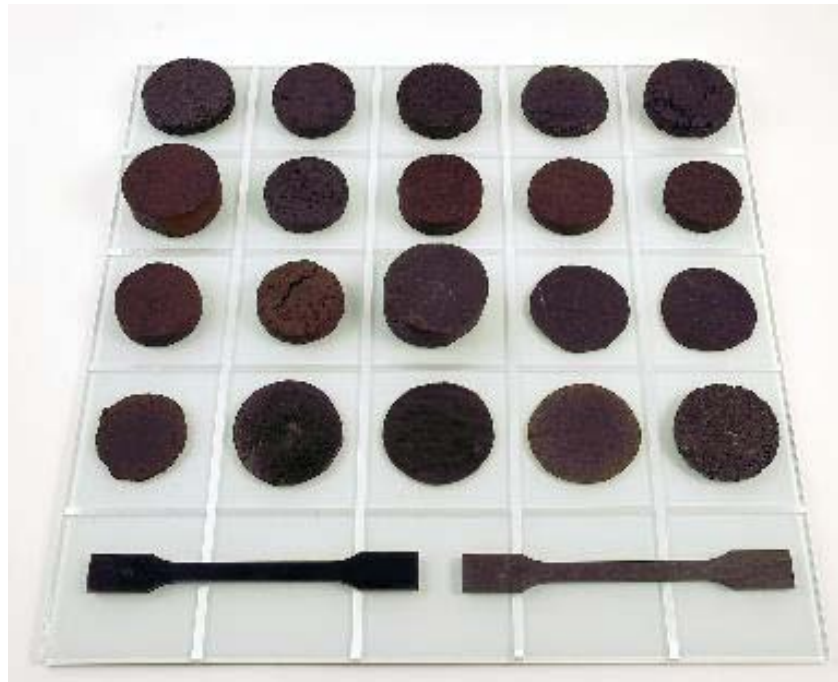


*Combining
coffee grounds with
biobased plastics*

“From coffee waste to CoffeeBased”

Combining coffee residue with a biobased and biodegradable binder.
Material research and product design by students in the minor Start-up Your Business in Technology and by graduation project of Marjet de Jong, student Product Design.

www.coffeebased.nl



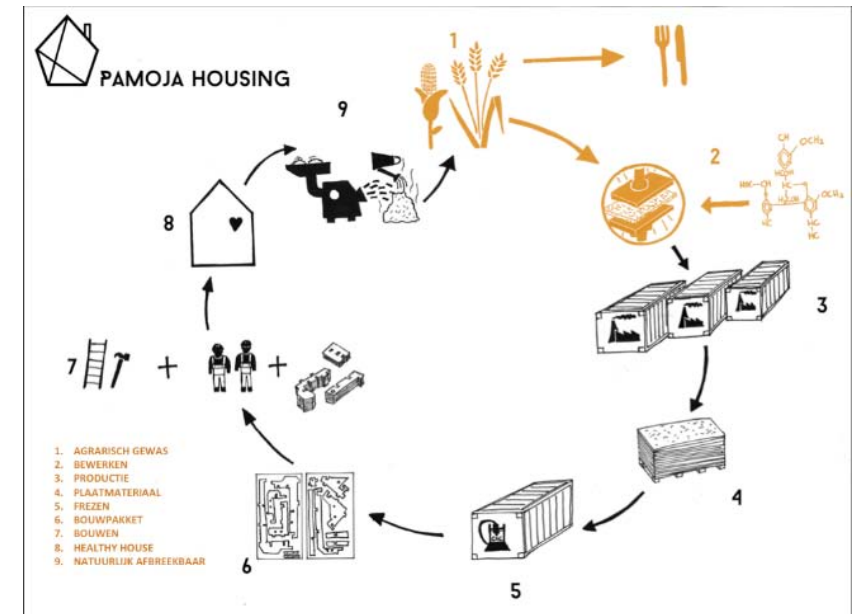


*Combining
organic waste with
biobased plastics*

PLANQ: 100% biobased fibre board

Combining plant residues with a biobased binder
for board materiaal for flat pack designs

Graduation students Built Environment



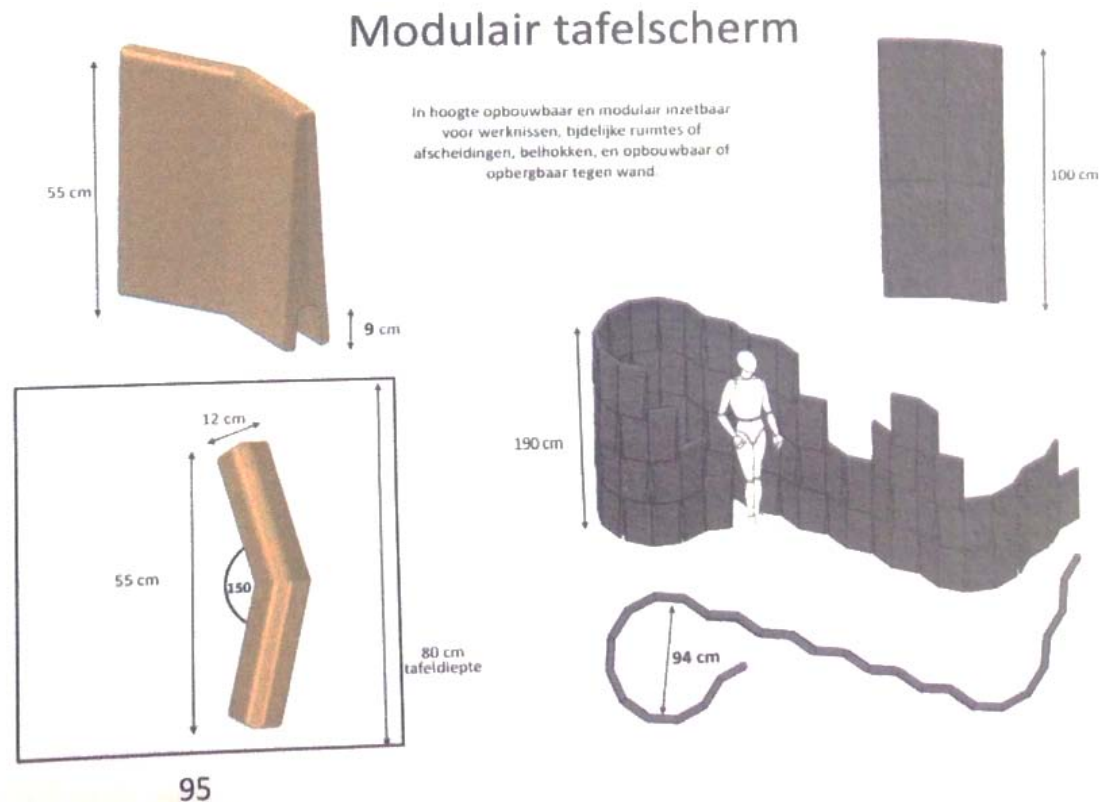


*Combining
organic waste with
biobased plastics*

Material selection and design for a modular table screen

Experimenting with material combinations of biobased plastics and organic waste. Research into acoustic properties and perception.

Graduation research with honours by Lisanne Jasperse, student Product Design





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*Combining
textile waste with
biobased plastics*



Experimenting with textile waste streams

Glasses case made of jeans fibres of
G-star combined with PLA

Experiments and design by students HvA,
minor New Materials



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RECURF: Re-using Urban Fibres and Biobased Plastics in Urban Products

Research project
(2015-2017)
in cooperation with:



Supported by:





Textile waste providers are launching customers of circular products

- e.g. interior products for Starbucks made of burlap coffee bags



- e.g. containers and products for Kaufhaus made of textile collected by Sympany





Creating and testing material samples

From fibres, wovens and non-wovens to material samples with pressing technique.

Evaluating mechanical and esthetical properties.

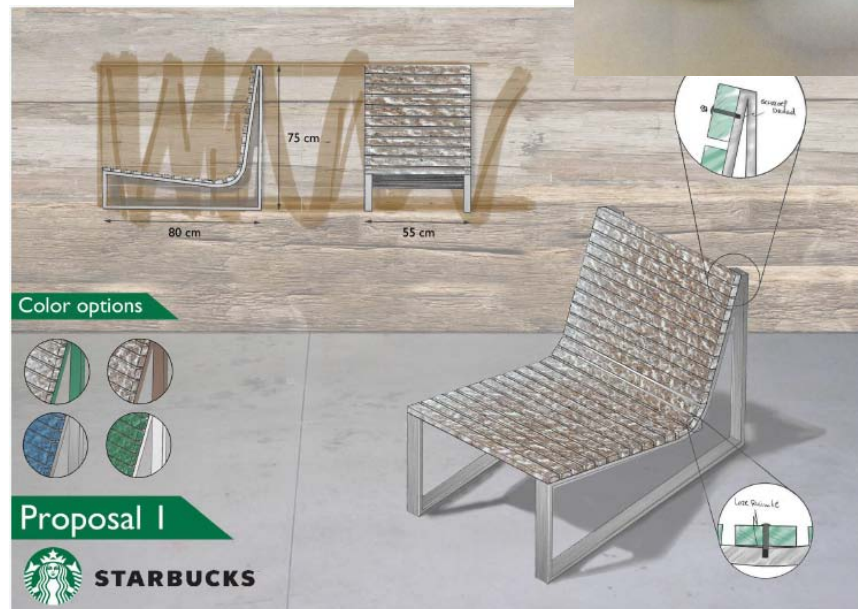
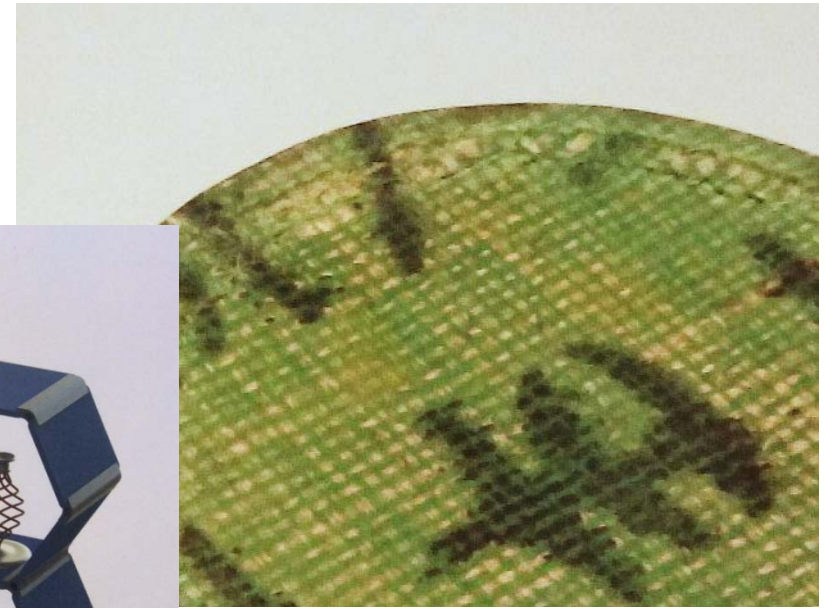




Designing applications

First results of ongoing work.

Experiments and design by students HvA





DESIGNING with ALTERNATIVE MATERIALS

1. Find and use the unique characteristics of the material
2. Match with the desired functionality and appearance of the product
3. Tune the material and production process for its purpose
4. Check the perception of the material in combination with the product
5. Make the material and its origine part of your story

More information at:

www.hva.nl/recurf

www.biobasedplastics.nl

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