FlexFunction2Sustain

Open Innovation Ecosystem for Sustainable Nano-Functionalized Plastic and Paper Surfaces and Membranes

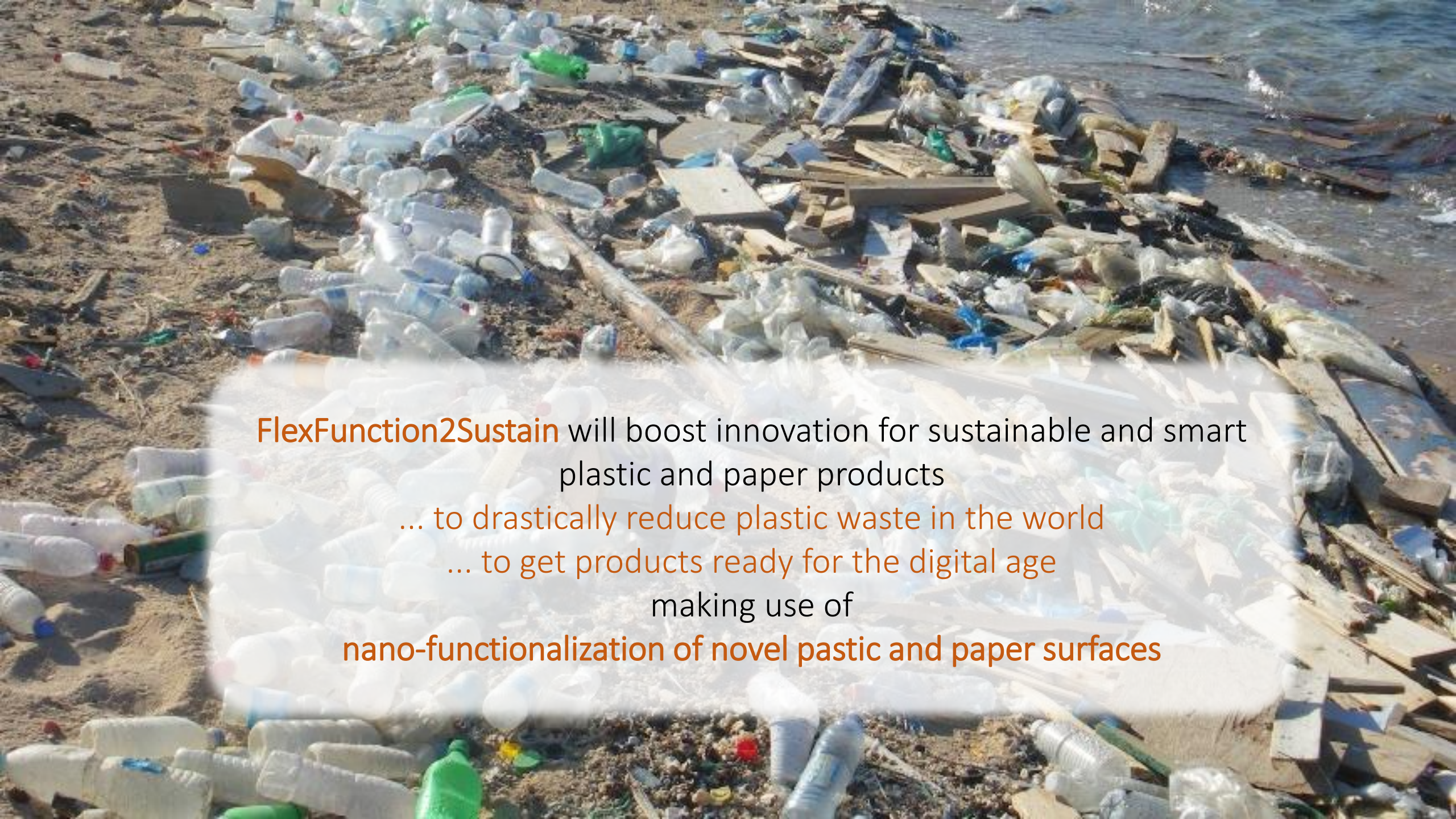
08 July 2020

14th International Symposium on Flexible Organic Electronics (ISFOE 2020)

www.nanotexnology.com

What is an Open Innovation Test Bed?

- **Open Innovation**: Increase innovation potential by partnerships for the innovation process
- **Open Innovation Test Bed - OITB**: Open ecosystem to maximise the innovation potential of novel ideas, technologies, and products
  - Network of Suppliers for complementary innovation boosting services
  - Single Entry Point: “Realiser for Innovation” as General Contractor and Management Entity for Collective Services



FlexFunction2Sustain will boost innovation for sustainable and smart plastic and paper products

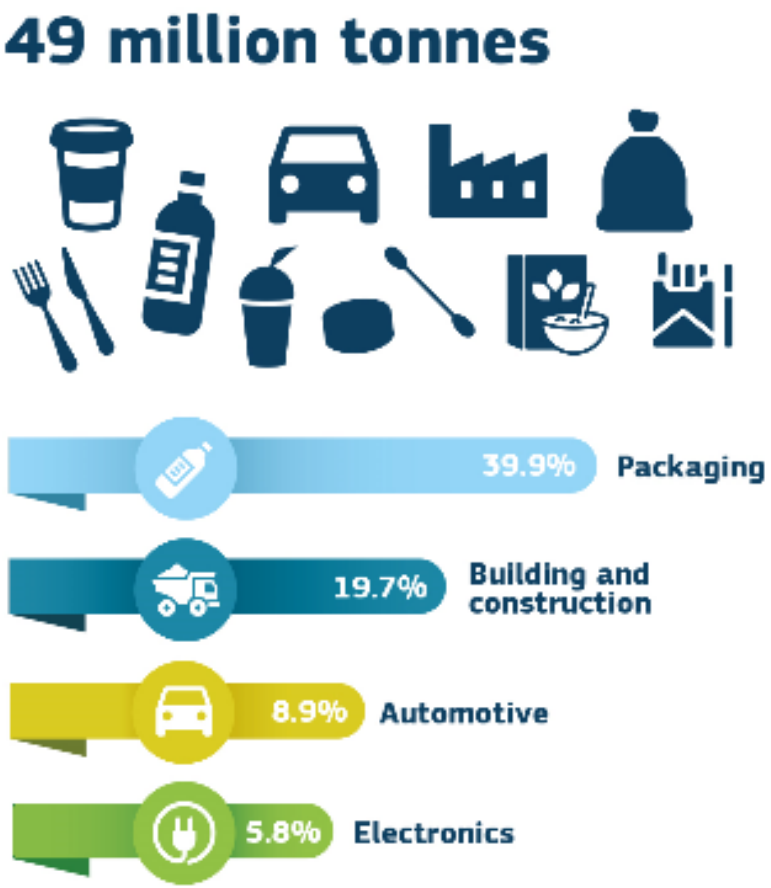
... to drastically reduce plastic waste in the world

... to get products ready for the digital age

making use of

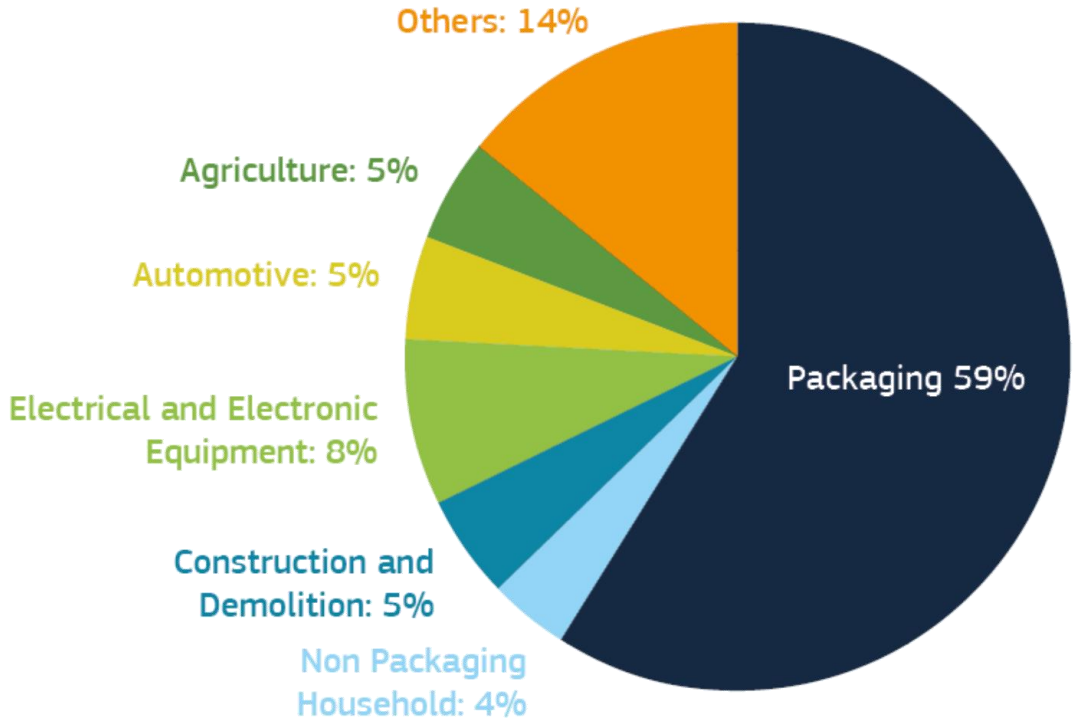
nano-functionalization of novel pastic and paper surfaces

Plastic Waste in Europe



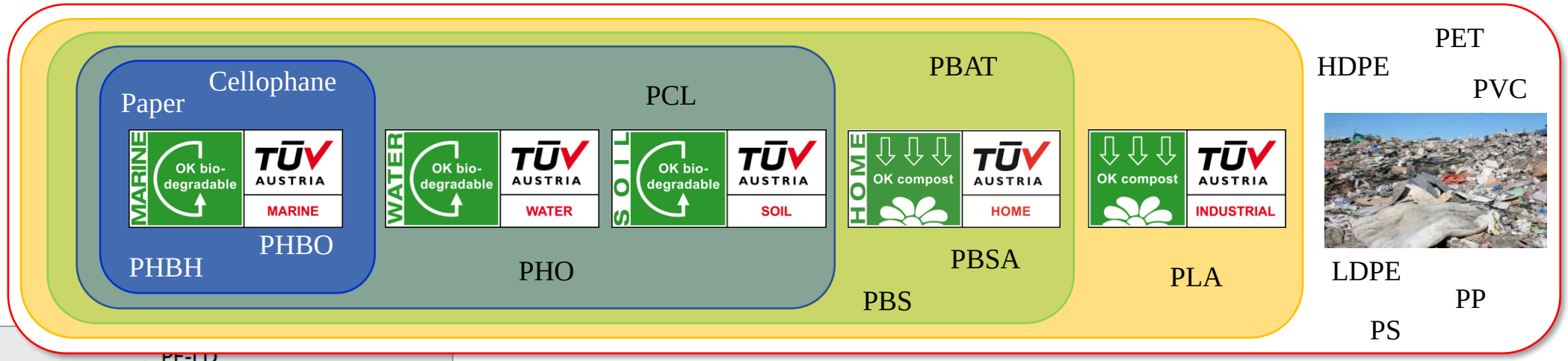
In 2015:

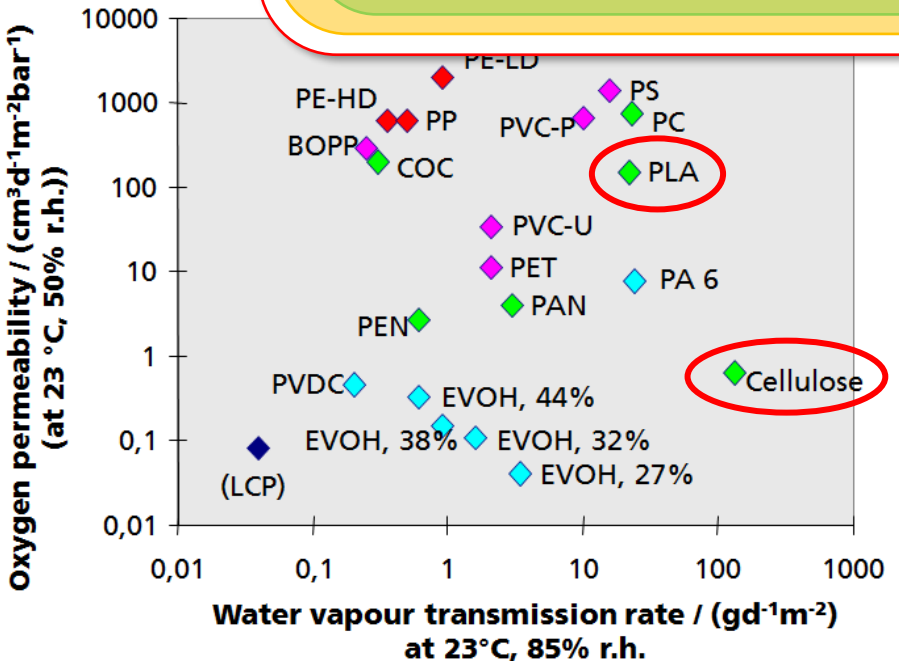
- 49 000 000 tons plastic demand in EU
- **25 800 000 tons plastic waste** generated in Europe
- **500 000 tons of plastic waste released to the Ocean** every year



source: European Commission: A European Strategy for Plastics in a Circular Economy

Materials for a circular plastics economy

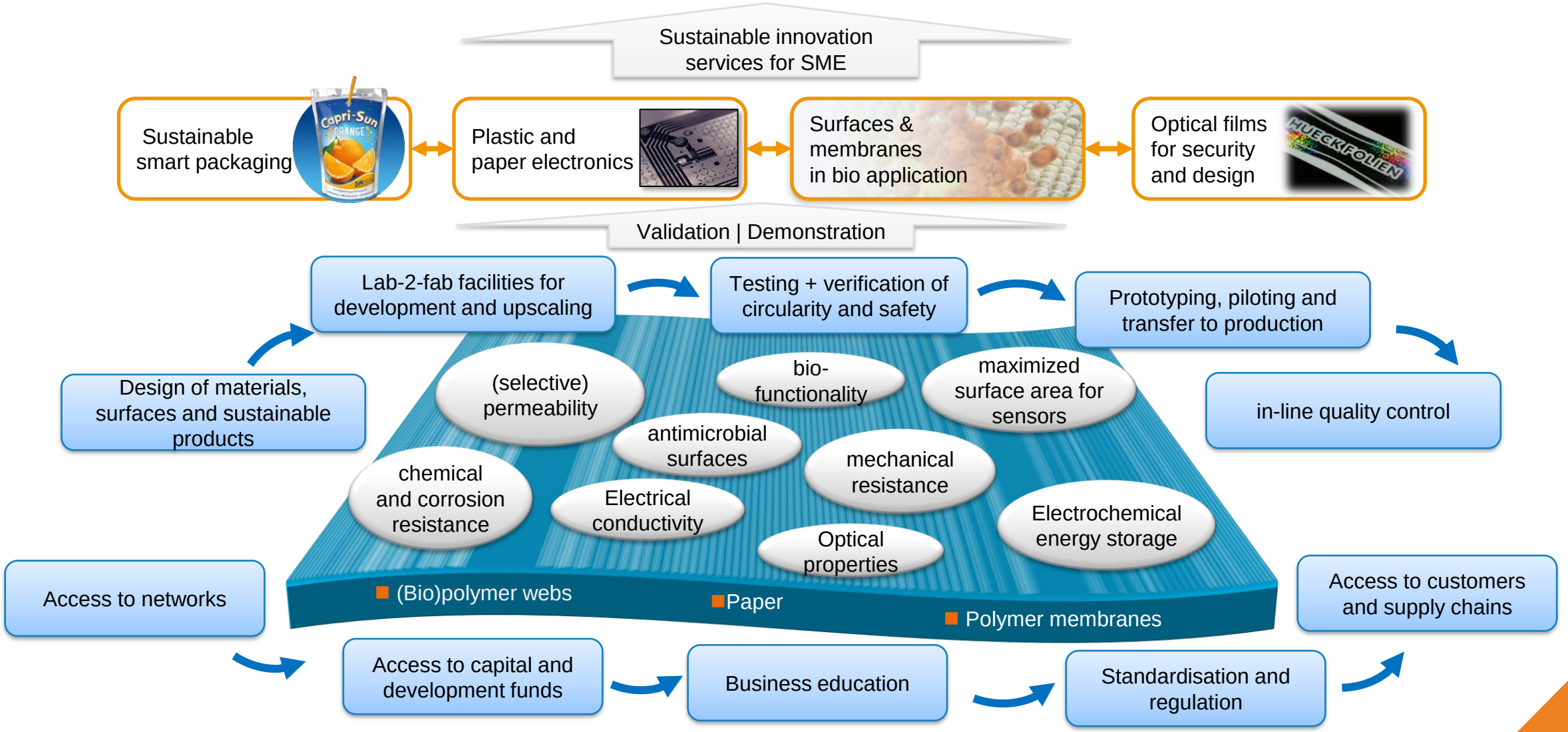




- Packaging today:
  - Composite materials such as PE / adhesive / Al / PE)
  - Non recyclable; non-degradable
- Objective: replace laminates by
  - Monomaterial (poly-olefine based)
  - Biodegradable plastics
- Challenges of such materials
  - Insufficient functional properties (gas permeability, etc.)
  - Low dimensional stability in processing

➔ Surface nano-fuctionalization to regain functional performance

FlexFunction2Sustain OITB Concept



The FlexFunction2Sustain Ecosystem

OITB Members | Industrial Validation | Potential Clients | External Stakeholders

Board of Investors and Foundations

External Advisory Board

(Networks, Regulations, Standardisation, and others)

Technical Facilities

Nanofunctionalisation of Surfaces

R2R Vacuum Coating

Atmospheric pressure coating, printing and surface treatment

R2R micro- and nanostructuring

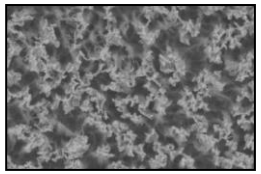
Printed electronics pilot lines

Circularity by Design

Compounding and Film Extrusion

Recycling and Bio-degrability Pilot Lines

Characterisation, Quality Control, Verification



Physical and chemical properties

MARINE OK bio-degradable TÜV AUSTRIA MARINE

Application Certification

Functional Performance Evaluation

NanoSafety Cluster

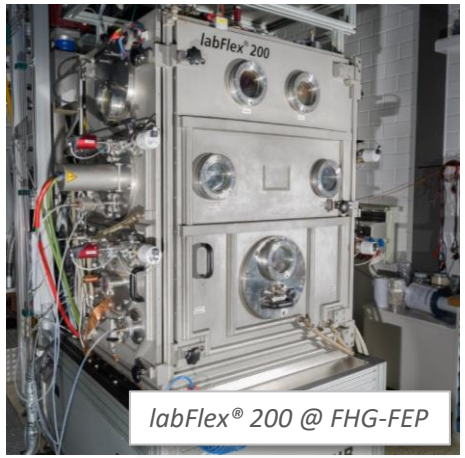
Nano-safety assessment

Technical Facilities

TRL4 [FHG-FEP] ➔ **TRL5 [FHG-FEP]** ➔ **TRL6 [FHG-FEP]** ➔ **TRL7 [AMCOR]**

LB9 @ FHG-FEP

A4 Sheets – 1 process

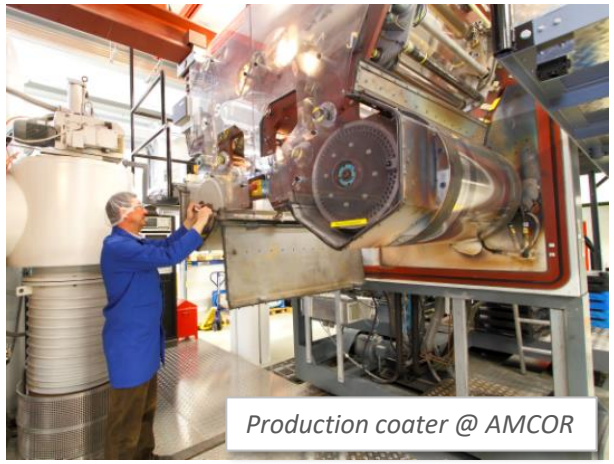


labFlex® 200 @ FHG-FEP

200 mm – 3 stations

coFlex® 600 @ FHG-FEP

650 mm width – 5-6 stations



Production coater @ AMCOR

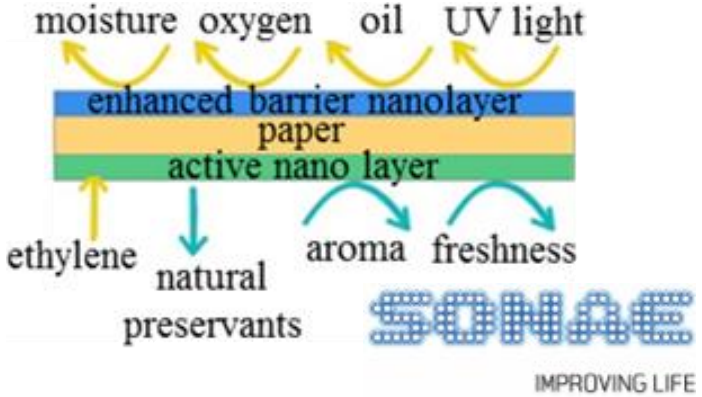
715 mm … 2000 mm width

- Lab-2-Fab approach for all processing facilities ➔ Each process available from TRL 4 to TRL 7+
- Facility upgrades target

(1) Ability to process biopolymers and poly-olefines
(2) enhanced productivity and efficiency
(3) improved reliability and process yield
(4) advanced inline quality control

Industrial Use Scenarios

Marine degradable
Shampoo sachets



Paper-based fresh food packaging

Biodegradable
security labels

HUECK FOLIEN

Recyclable mono-polymer
drink pouches

Innovative plastic
surfaces in cars

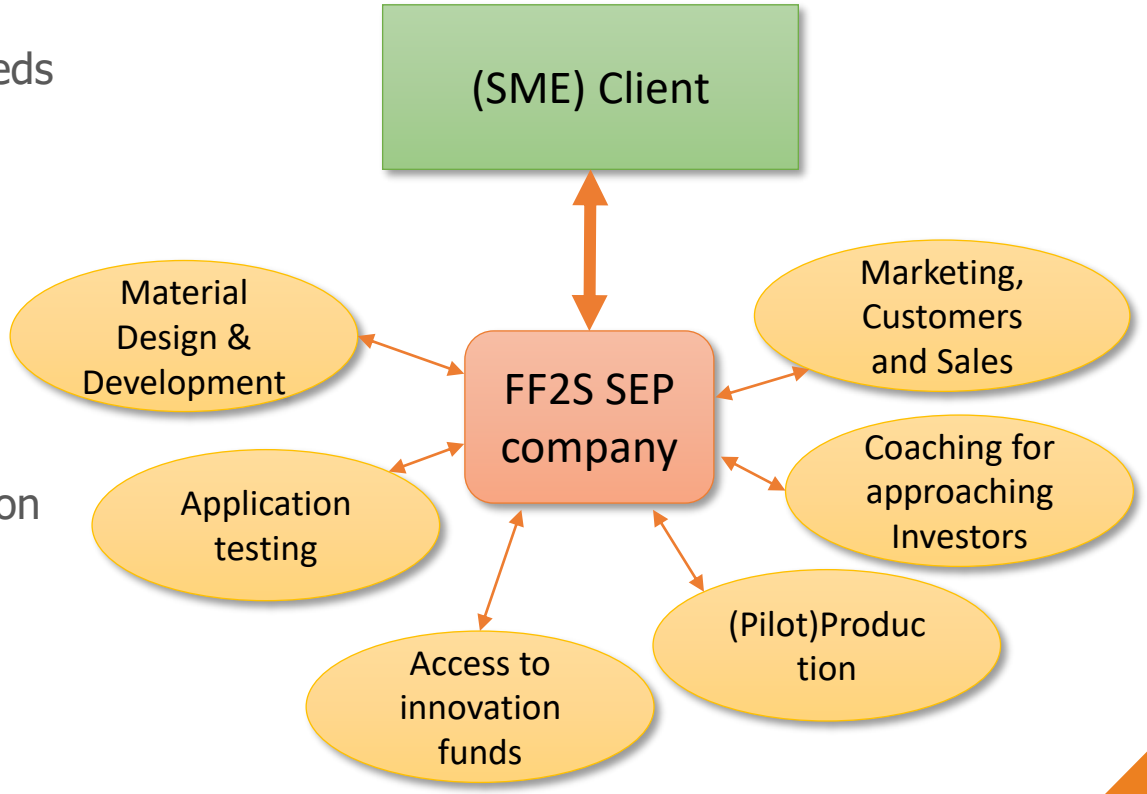
CRF CENTRO RICERCHE FIAT

i3 membrane
bringing power to separation

Selective and switchable
water filter membranes

Why should I use an OITB ?

- Holistic Services from a single contractor (SEP company)
  - One contract – multifold services focused on customer needs
  - Innovation Services from > 10 EU countries,
    but in your language!
  - Renowned experts assemble best-suited,
    "best value for money" services for your innovation
  - SEP does all management and progress tracking!
- Customer-friendly liability and warranty terms for pilot production
- Integrated Business Services, Coaching and Finance Access
  - Link to Investors and Access to R&I Funds
  - Coaching and consulting on business models and markets
  - IPR services and due diligence



Timeline

2024: Sustainable FlexFunction2Sustain OITB Operation

December 2021 and 2022: Competitive Calls for pre-commercial pilot projects

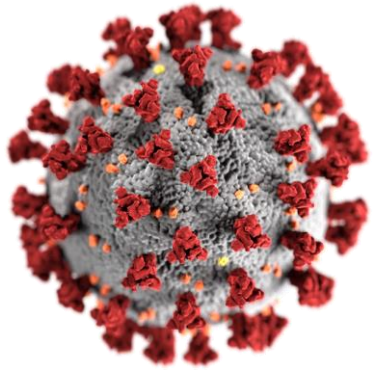
2022: Pilot lines upgraded for biodegradable plastics and increased productivity and reliability

Early 2021: Single Entry Point company operational and FlexFunction2Sustain Consortium Member

2020: OITB Member Pilot Facilities accessible for Customer (direct contracts)

COMING SOON

2020 – COVID-19 Epidemic Emergency Response

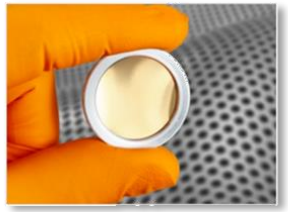


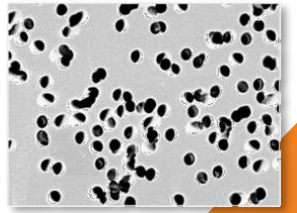
120 nm

„Viruses are electrically charged organic nanoparticles“

- Anti-Glare Coatings on Plastic Personal Face Shields
- Anti-microbial and anti-viral surfaces
  - Anti-viral nanoparticle-in-matrix and nano-porous coatings
    ➔ virus-repellent surfaces in public transport
  - Nanoimprint Lithography of micro- & nanostructured surfaces
- Large-area high-throughput sterilisation of surfaces and medical devices
  - With electron beams
  - With atmospheric pressure inert or reactive plasma treatment
- Metal coated membranes for virus diagnostics in fluids
  - Electrically charged membranes for virus accumulation
    ➔ Faster and more reliable diagnostics

Image source: Berliner Zeitung





Thank you very much for listening!

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