Sustainable manufacture systems towards novel bio-based materials

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Sustainable analysis

AIMEN, ZAG, GIG

Circularity by design

GIG, AIMEN,MYX,UBRIS, FHF

Manufacturers

FHF, NCC, GUALA LBRT

Chemical optimization

UBRIS, NIC, NCC, MYX, FHF

Green and Smart Manufacture

IDE, IRIS, AAU, FHF

NCC,LBRT, NIC

End users

ZAG, UBRIS, GUALA LBRT, TDZ,

Business, communication and dissemination, exploitation activties

AXIA, NSB, FHF, LBRT, NCC, AAU

THE PROJECT

GREEN-LOOP project aims to design and optimise three innovative bio-based materials and components for three main industrial sectors

Multifunctional fire-retardant and Vibrational pads from Bio-Rubber for Building & Construction

Bottle closures from Bio-Plastic for Food & Beverage

Sliding bearings from Wood Composites for Tooling & Appliances

MAIN CHALLENGES

1

BIO-RUBBER VALUE CHAIN

As rubber waste accounts for up to 2% of global physical waste, the main challenge is to develop a product that incorporates some of this rubber into reusable items. By embedding a bio-based material, NCC partners aim to formulate a sustainable material that can be developed into a viable product.

2

BIO-PLASTIC VALUE CHAIN

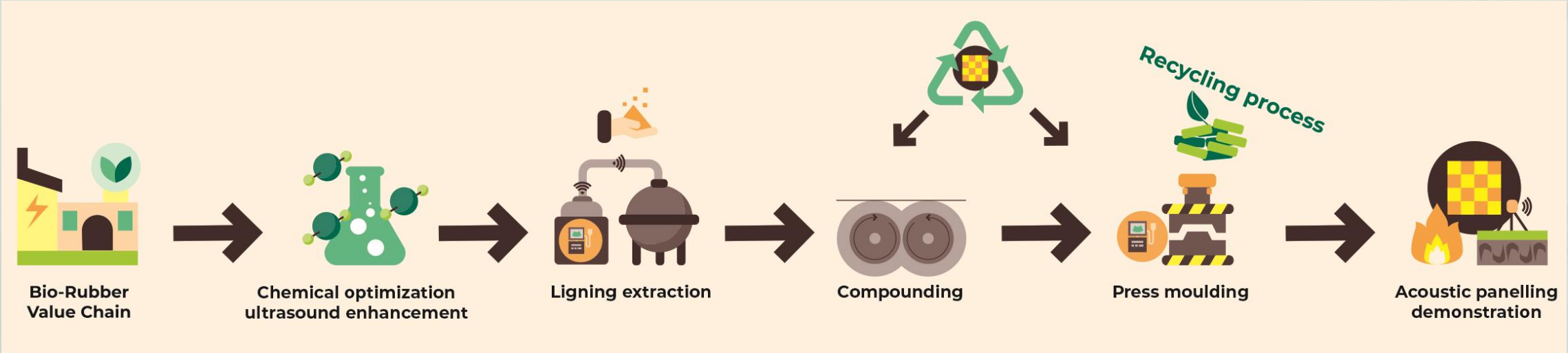
The partner Guala Closures LaBrenta validated the production of caps for bottle of olive oil and for the bottle of limoncello with the bioplastic produced by MixCycling partner.
The main challenge is to optimize the characterization in order to reach the performances that is requested from the closure system.

3

WOOD COMPOSITES VALUE CHAIN

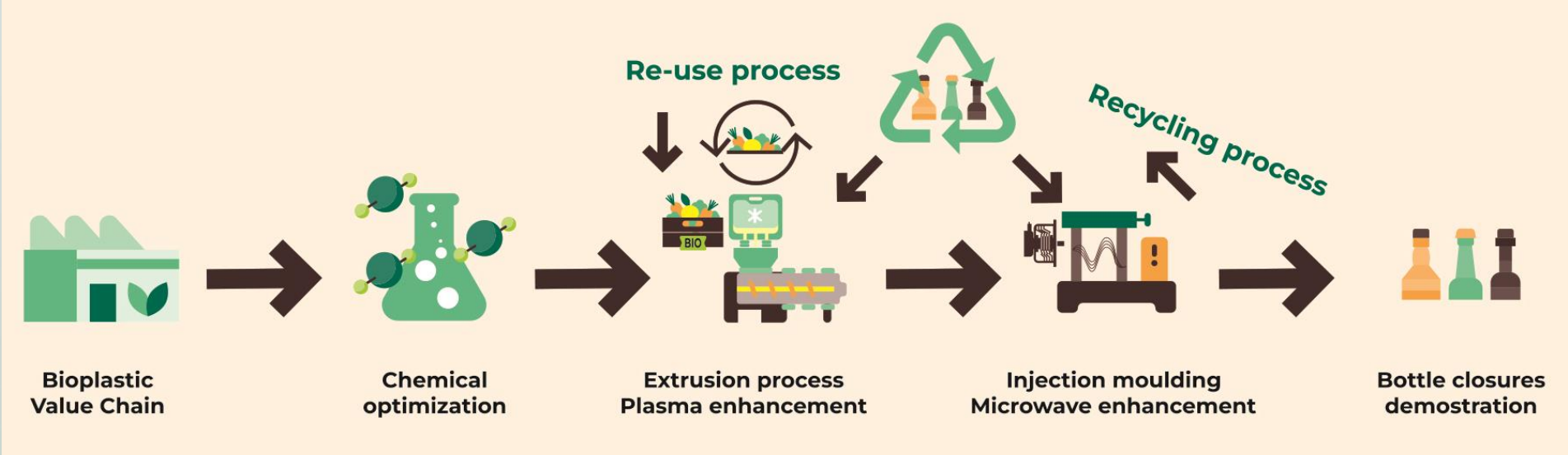
The development of wood composites aims to create a bio-based material to replace standard plastics. This involves developing a new manufacturing process, including novel extrusion methods and microwave technology integration. FRAUNHOFER's role is to develop new materials, particularly for sliding bearings.

BIO-RUBBER VALUE CHAIN



The product is made of recyclable thermoplastics and elastomers. The bio-based raw materials are lignin and natural rubber. The rubber pads are first validated at the laboratory scale and, once the most suitable combination of sustainable materials is selected, representative samples are manufactured and integrated into real condition tests to demonstrate fire resistance and seismic response under relevant industrial conditions.

BIO-PLASTIC VALUE CHAIN



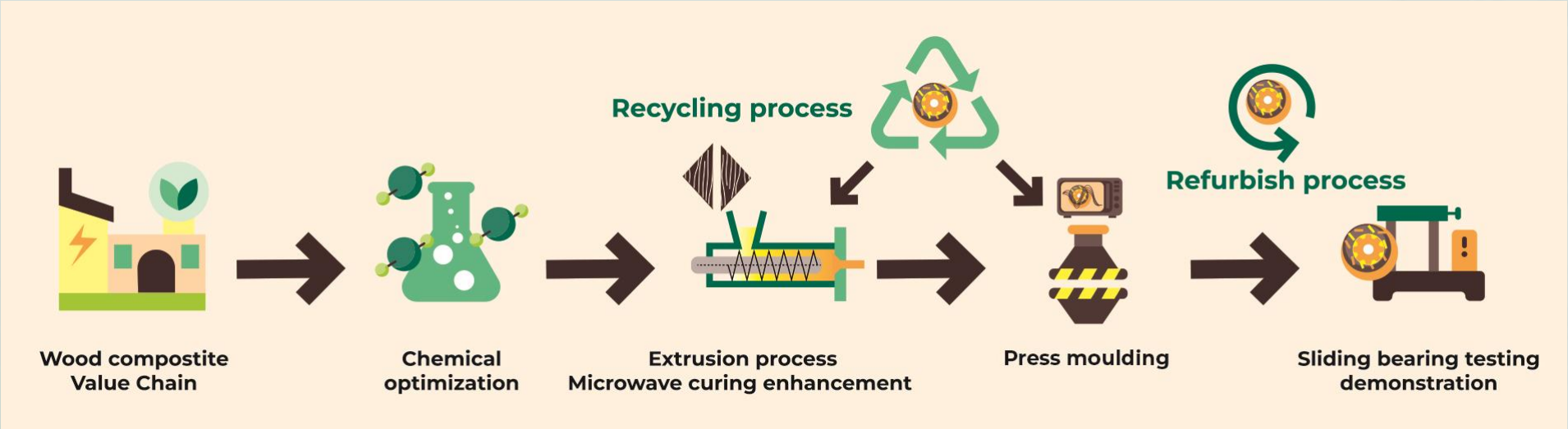
These bottle closures use 100% biodegradable materials. The bio-based raw materials are natural fibers and biodegradable thermoplastic carriers. Bottle closures are first validated at laboratory scale, testing different natural fibers collected from the agro-industry supply chain. Once the most suitable bio-composite material is selected, representative samples or components are manufactured and integrated into real conditions tests in a bottling system.

Study visiting MixCyclingof GREEN-LOOP Partners in Breganze, Italy, March 21th, 2024

Study visit at Guala Closures LaBrenta

GREEN-LOOP Partners in Breganze, Italy, March 21th, 2024

WOOD COMPOSITE VALUE CHAIN



The wood composite bearing is first validated at the laboratory scale. The reinforcement of the matrix by natural wood fibers/particles is then studied, along with the curing of the biopolymers. Once optimized friction, wear, and lifetime of the wood composites are obtained, representative samples or components are manufactured and integrated into real condition tests.

ACHIEVEMENTS

1 BIO-RUBBER

- Eco-design with bio-rubber compounds
- Upgrades of equipment in manufacture lines with Ultrasound-Assisted Lignin Extraction and Chemical Devulcanization of Rubber

This value chain could be replicated in other sectors such as **aerospace**, **automotive** and **marine transport trimming**.

2 BIO-PLASTIC

- Finalization of electromagnetic and mechanical studies for the new hopper machine design (IDR).
- Production of olive oil bottle caps samples, some adjustments to the bio composite blend are needed (LBRT).
- Study on a bio expander to add to the formulation to simplify the Production of Limoncello bottle closures (LBRT).
- Installation of sensors scheduled (IRIS).

This value chain could be replicated in other sectors such as **agriculture**, **horticulture** and **packaging**.

3 WOOD COMPOSITES

- Very low friction coefficients achieved with Wood Vomposites.
- Good wear resistance of Wood C, comparable with various PA4.6 benchmark materials.
- MW-system and sensor integrated into extruder system to reduce energy consumption.
- Manufacturing net-shape WoodC bearing prototypes and testing in industrial environments (TRL6)

This value chain could be replicated in **building** and **material logistics**.