INN PRESSME

Open Innovation Test Bed

Biobased plastic parts by 3D printing

Policy and dissemination event

Brussels, 26th January 2024

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aitiip centro tecnológico

Contents

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°952972

OBJECTIVE

Use **bioplastics and natural fibres**, to tailor biobased materials with properties and functionalities that equal or outperform their fossil counterparts at competitive prices by **using 3D printing technology**.

Automotive Components & Personalised inner shoe soles

CONVERSION

PL4. IWN-NF

- Provide **micro/nanofibres**

FORMULATION

PL8. CEA-POUD
AIT- COMP

- **Formulation** and optimization of bio-polymers with different loadings of fibres.
- **Characterisation** of new materials

PROCESSING

PL9. IPC-METEOR

- **Extrude filaments for 3D printing** with developed biobased materials

PL16. AIT-3DP

- **3D print** automotive components
- **Apply coating** to the final pieces

PL10. FISC-NP

- **Develop coating material** with specific functionalities

END-USER

CRF

- Automotive components **assembly**
- **Validation** of the parts in vehicle conditions

PODOACTIVA

- Inner sole **assembly**
- **Validation** of the inner sole with real patients

Conversion – Flax/Hemp microfiber preparation

- Goal of **degumming** – removing of substances gluing elementary fibres together to make possible to obtain micro-size diameter of the fibres.
- Goal of **silanization** – improvement of adhesion between fibres and polymer matrixes.
- Goal of **grinding** – obtaining of micro-size length of the fibres
- Goal of **wringing** to improve efficiency of microfibers purification.

- Capacity of the pilot line is approximately 20kg/day

Formulation

Automotive Components

liten cea tech

PA10.10 + 5% FLAX

COMPOUND

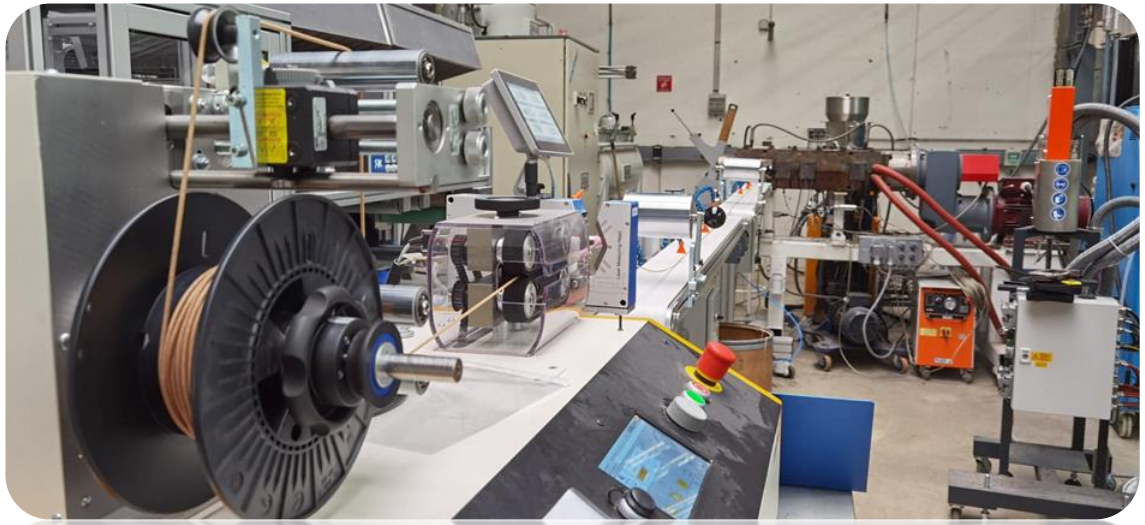
Personalised inner shoe soles

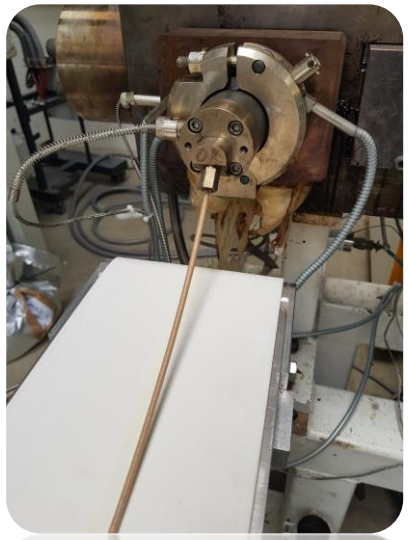
aitiip centro tecnológico

BioTPU + 5% HEMP

COMPOUND

Processing – Filament Production





AUTOMOTIVE PARTS

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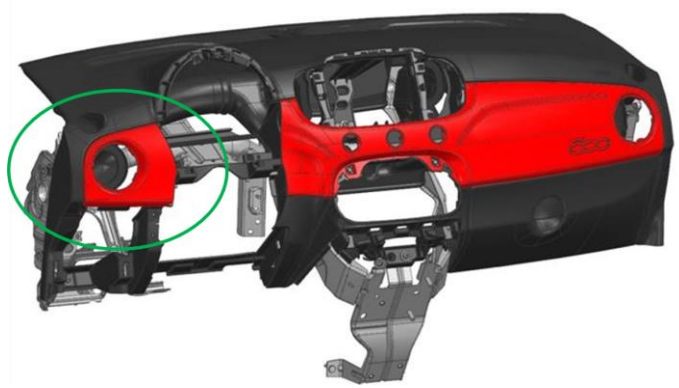
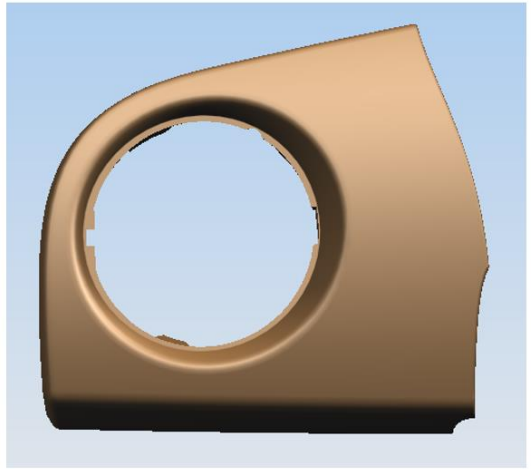
3D Printing Demonstrators - Design

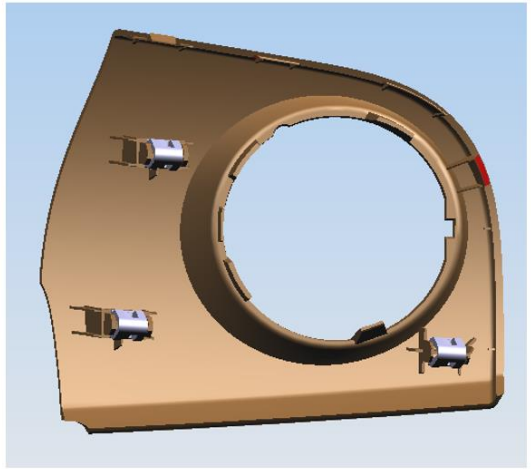
Fiat 500 dashboard fascia on driver side: Aesthetical trim of the instrumental panel assembly



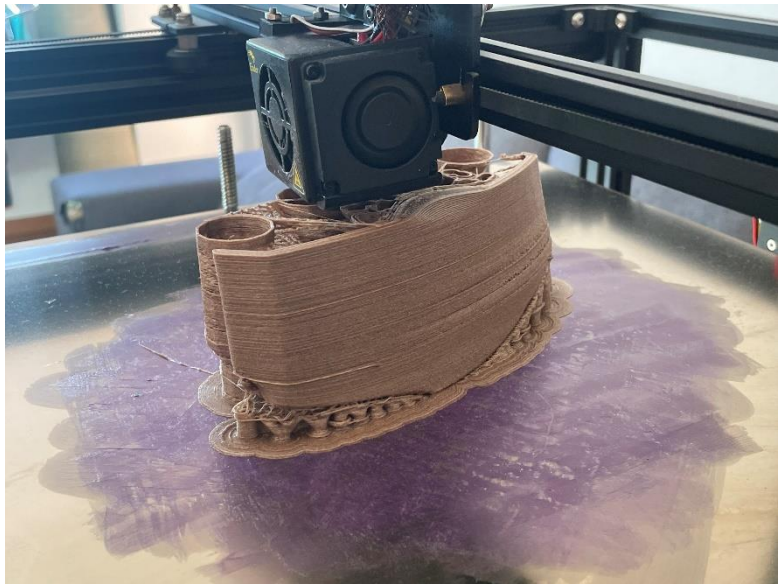
Front view



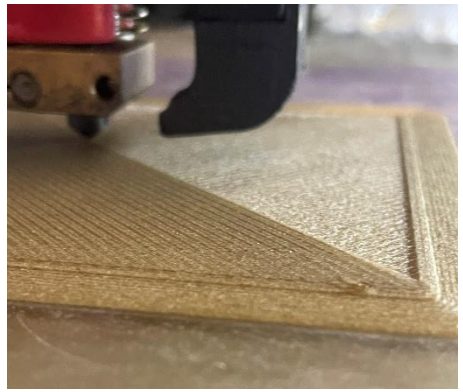
Rear view

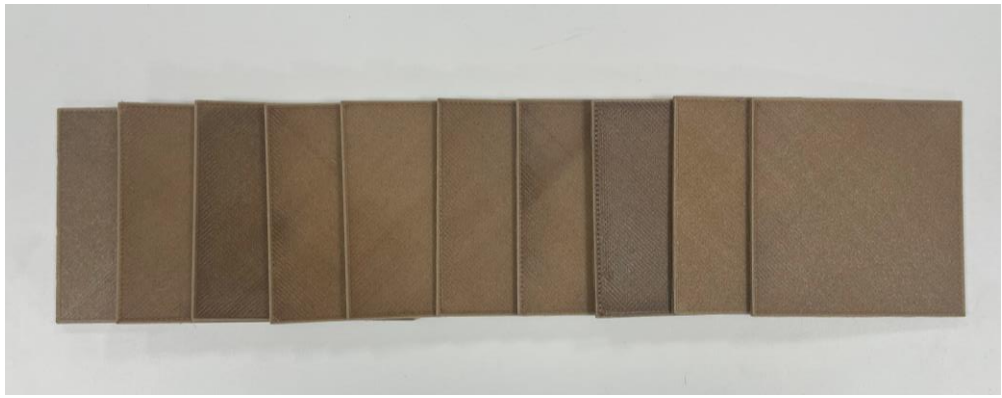


3D Printing Demonstrators - Design



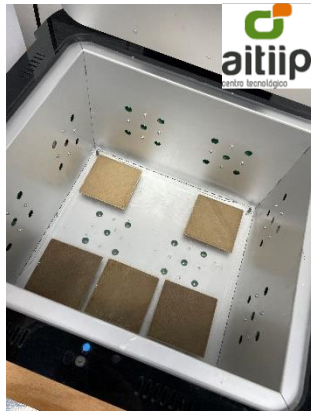
3D Printing Demonstrators - Coating





10 squares (10cm x 10cm) → Printed for validation

- 5 non-coated
- 5 coated with ORMOCER developed in the project by Fraunhofer ISC



Antibacterial properties

Validation of automotive parts

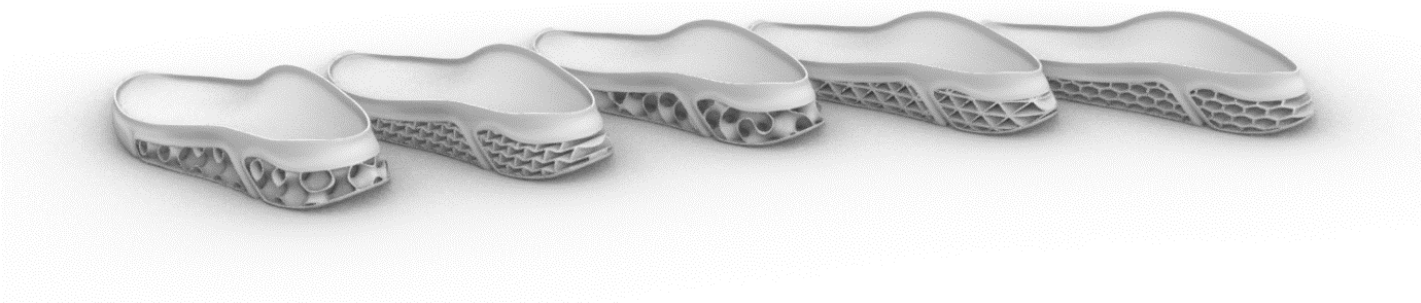
Tests performed:

- ✓ Fluid Resistance Test
- ✓ Xenon Exposure Test
- ✓ Olfactory Test
- ✓ Cold Impact Test
- ✓ Thermal Cycle Test

PERSONALISED INNER SHOE SOLES

3D Printing Demonstrators - Design

Personalised inner shoe soles:



3D Printing Demonstrators - Design

DESIGN MODIFICATIONS - ITERATIONS

The initial lattice structure did not provide adequate support, particularly in the heel area, and resulted in instability during walking.

Entire insole surface joined to prevent the formation of redundant walls generated by the FDM method

Final design

3D Printing Demonstrators - Coating

bioORMOCER prepared by Fraunhofer ISC → aitiip centro tecnológico Coated inner shoe soles

Plasma pretreatment

Spray coating

UV post-treatment

Antibacterial properties

Upper design and union

Design of the **upper of the shoe**, choice of colours and design to be attached to the shoe.

100 % recycled materials

Final prototype

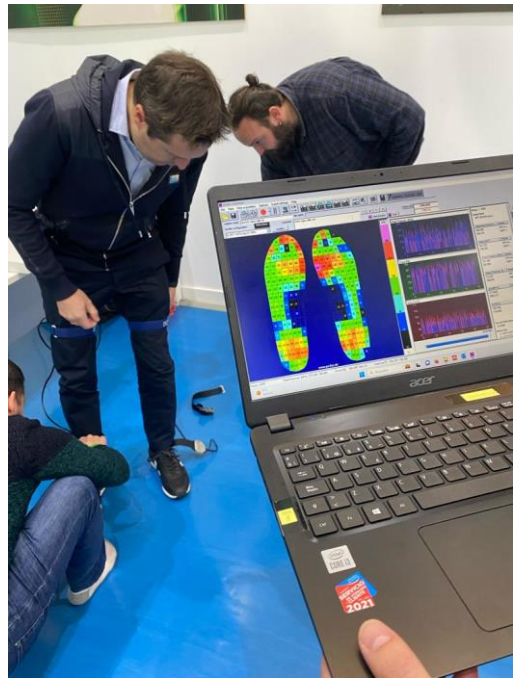
Validation of personalised inner shoe soles

Tests performed:

✓ Test of validation with instrumented insoles in 4 subjects and Lyfetime test

Conditions:

1. **Generic shoe without personalised insole**
2. **Generic shoe with personalised Podoactiva insole**
3. **INNPRESSME Custom footwear**



Measured difference between:

- ✓ **Mean pressures**
- ✓ **Maximum peaks of pressures**
- ✓ **Total contact surface** (area of contact)

Conclusions

Automotive parts

The results obtained has given a good and positive confidence on the applicability of this material to produce an interior automotive component.

Personalised inner shoe soles

The material developed for the project meet the specifications and technical requirements of specialized podiatrists. Functionally, the sole has been observed to meet the requirements of a therapeutic insole and has demonstrated resistance over a high number of cycles, indicating durability.

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Thank you!

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