Forest based composites for facades and interior partitions to improve indoor air quality

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Goal of the project

To improve indoor environmental quality and energy-efficiency by developing forest based bio-composites and products for facades and interior partitions to be applied in retrofitting and new building
Key Innovations

we started with little and went ..........
Key Innovations

From this

To this
Key Innovations

Throughout the project the partners have maintained a focus on the end game:

Real life Case Studies

To show real life applications
Key Innovations

**INTERIOR PARTITION WALL**

Currently, the most common interior partitions are made of brick. Not only is achieving adequate acoustic insulation with brick complex, but the need to use water in their construction necessitates very long installation times.

**WINDOWS**

Due to lower structural requirements, window profiles can now be made of wood, aluminium, PVC and polyurethane.

**CURtain WALL SYSTEM**

Curtain wall façades incorporate aluminium profiles that support large glass panels.

**MULTI-LAYERED FAÇADE**

Over the past few years, the construction industry has begun to use this type of façade as a replacement for traditional brick and mortar. Once assembled, these layered façades meet the same insulation and protection requirements of traditional façades.
Work Development

Selection of different BIO-materials

Product design requirements

Standard & Market requirements
- Spanish Building code
- Estonian Building code
- German Building code
- EN-13830
- Environmental market requirements
- Key market aims

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Work Development

- Multifunctional coating
- Fibrous foam wallboard
- Interior Partition Thermoset biopolymer profiles
- Multi-layer façade Thermoset biopolymer profiles
- Curtain Wall Thermoset biopolymer profiles
- Thermoplastic FR sheets non-PLA compounds
- FR, low-VOC bio- adhesives
- Thermoplastic FR PLA compounds
- FR cork insulation
- Exterior cladding panel
Work Development

- System design: Interior Partition
- System design: Multi-layer facade
- System design: Curtain wall facade

Analysis of requirements
Development of materials
Design of products
Development of products
Testing
Implementation
LCCA and monitoring

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Work Development

Lab-Scale Prototypes for testing

Scale-up of Manufacturing processes

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Work Development

Air permeability, Water tightness, Fire resistance, Thermal behavior, Wind load resistant....

All tests have been successfully passed

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Work Development

Design of the Structure of the Demo buildings

- Analysis of requirements
- Development of materials
- Design of products
- Development of products
- Testing
- Implementation
- LCCA and monitoring

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Work Development

Pre-assembly of all the systems

- Analysis of requirements
- Development of materials
- Design of products
- Development of products
- Testing
- Implementation
- LCCA and monitoring

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Work Development

- Analysis of requirements
- Development of materials
- Design of products
- Development of products
- Testing
- LCCA and monitoring

Manufacturing of the external cladding system

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Work Development

Kubik & San Sebastian Demos

Analysis of requirements
Development of materials
Design of products
Development of products
Testing
Implementation
LCCA and monitoring

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Work Development

Tartu Demo

Analysis of requirements
Development of materials
Design of products
Development of products
Testing
Implementation
LCCA and monitoring

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Work Development

Monitoring of the three demonstrators in different climatic areas.

LCCA and Monitoring
Achievements

- New eco-innovative materials to create a façade identity have been developed.

- The good indoor environmental quality of the materials has been validated.

- Process up-scaling has been demonstrated.

- We have designed the constructive elements (multilayer façade, curtain wall, window and partition system) to fulfil all requested standards and integrate in the buildings.

- Lab-scale prototypes and real scale prototypes have been manufactured.

- Have been demonstrated that the systems fulfill all the requirements with the testing of prototypes: mechanical safety, acoustic insulation, air permeability, thermal insulation, fire safety...
Achievements

✓ Three demo buildings have been defined:
  ✓ KUBIK experimental building (Spain)
  ✓ Two new buildings with different climates: San Sebastian (Spain), Tartu (Estonia)

  • San Sebastian: 1 flat of 50m² in a 7 floors new residential building
  • Tartu: new public building for sports of 275m²

✓ Installation of the systems in the demo buildings

✓ Monitoring: IAQ, Thermal performance
What has been demonstrated at the end of the project? (TRL:7)

**Keys for market penetration**

- The **technical viability** of using bio-based materials on constructive elements to be applied in different European climates, assuring more comfortable buildings regarding energy efficiency and IEQ. ➔ Reliability
- Demo buildings will be a **showcase** for the developed novel materials ➔ Benefits must be proved
- Creation of a **façade identity** by using eco-innovative materials that allow ➔ differentiation

**Educate perception**

- Design process has considered the possibility of combining the different new elements with traditional systems to **facilitate market penetration**.
- Partner companies will be **ready to launch** novel innovative products for construction into the market.
Thank you for your attention

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