

Marquetry4World – Development of innovative marquetry applications integrating new materials and industry 4.0 processes

Summary

Scope – The wood industry and its derivatives are in full expansion. The emergence of new foreign markets and the acceptance of domestic manufacturing is, in this regard, a positive sign. Marquetry is an ornamentation technique of applying pieces of veneer, with different colours, to create geometric or organic patterns. This type of product has an important historical value, which is part of the heritage of Portuguese furniture and construction of the 17th and 18th centuries.

The MARQUETRY4WORLD project aimed to develop new digitally assisted manufacturing techniques and new added-value applications for marquetry. It is also important to highlight the importance of preserving the product's heritage value and aesthetic for use in different sectors of luxury markets.

Main objective

Development of new manufacturing techniques, new forms of application, and new functional characteristics of marquetry that address new sectors and new market segments with demonstrated commercial arguments.

Project activities

Preliminary studies – Development of the concept of a new marquetry product, and the definition of functional and safety requirements, with a view to its optimisation and application on different surfaces. Market surveys related to the emergence of new competing alternatives and possible requirements imposed by new application sectors.

Study of materials, production conditions and modes of application – Definition of materials and technologies integrated in the manufacture of marquetry products and verification of production and application conditions. At this stage, it was intended to evaluate new materials that could be used as a basis for the application of marquetry, as well as new bonding and finishing products. Samples were produced and tested to characterise their physical, chemical, mechanical and durability properties.

Manufacturing approach – New digitally assisted industrial production techniques were defined and implemented. Preliminary tests were carried out to evaluate the behaviour of wood veneers during laser cutting and pressing process. The processes of assembly of the marquetry products were also explored and defined, as well as guidelines taking into account its application on organic and/or complex geometric surfaces.

Experimentation and validation – Models and prototypes were built and submitted to experimental campaigns, in the laboratory and under real conditions, which allowed to evaluate the final performance of the new marquetry solutions. The "BIM" technology of the product was also implemented.

Dissemination of project results – The promotion and dissemination of the results of project results were done through preparation of technical data sheets, flyer and x-banner.

Main results achieved

- New concept of marquetry production based on automation of the manufacturing process through the introduction of laser technologies for cutting the wood sheets;
- New marquetry products, experimentally assessed with regard to physical, mechanical (Figure 1), chemical and environmental performance, with a view to their application in different sectors;
- Marquetry solutions applied to different types of substrates, ensuring the appropriate quality and durability of the marquetry products;
- Conceptual studies to develop marquetry products that could be applied to surfaces with more complex shapes;
- Increased efficiency in the manufacturing and assembly processes and reduction of waste associated with the manufacturing process.



Figure 1. Pull-off test.

Project Reference

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Leading Institution

Workwood Concept (Portugal)

Partners

Itecons – Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade (Portugal)

CERIS Principal Investigator

João Almeida
(joao.almeida@itecons.uc.pt)

CERIS Research Team

Inês Simões, Julieta António, Rosário Fino, Michael Brett

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CERIS

Coimbra Hub: 266 506.04€

Project Website

<https://www.itecons.uc.pt/services/projects/106>