



Novel Acoustic Performance

Newsletter N°2

SILENTWOOD
EU FP7 project for
SME Associations
(2010-2013)

**Multilayered
wood-based
doors with
enhanced
acoustic
insulating
properties for
dwellings,
sanitation and
educative
centres**

Editorial

Welcome to the second newsletter of the SILENTWOOD project.

Background

The general goals of SILENTWOOD is to allow the European SME manufacturers of wooden products for construction - represented by the SME participants and the members of the participating SME Associations - to comply with existing building regulations on European level while increasing their long-term competitive margin.

At the same time, SILENTWOOD will open a new door for panel manufacturers to new market opportunities that can help them to face their current critical situation. Finally, this project has the goal of contributing to the foundation of a common European regulation on building acoustic.

First prototypes of SILENTWOOD already generated!

As the project is reaching its end, the present newsletter introduces the latest updates of the R&D work, where the partners are currently finishing the prototyping and the validation trials. So far, the project objectives in terms of acoustics and mechanical simulation have been achieved, along with the manufacturing and testing of 3 prototypes (1 panel and 2 doors).

The final door prototype, based on both simulation optimization and feedback from the first tests, is currently under manufacturing and will be tested (acoustic, mechanical and fire resistance) in a short time.

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Progress of Research & Results

During the 2nd period, the SILENTWOOD project has completed most of the scientific and technical work planned for this period. The following main technical objectives were achieved:

TECHNICAL OBJECTIVES

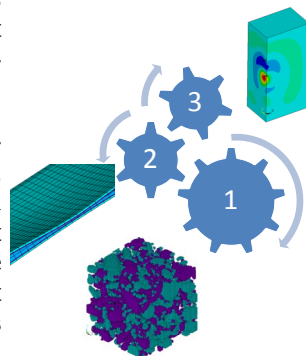
- * **Sound Reduction Index (SRI) $\geq 38\text{dBA}$,**
(Goal: above 40dBA for a door thickness below 45mm)
- * **Thermal insulation (U-value $\leq 1.6\text{W/m}^2\text{K}$)**
- * **Fire-proofing resistance: IE2 90-C5**
- * **Weight below 90kg**
- * **Price range: €400-450**

- ◆ A customized acoustic simulation tool for multi-layered panels, based on the Transfer Matrix Method, has been implemented and validated for a large set of multi-layered panels consisting of different WPC materials and configurations. A numerical method, based on the Finite Element Method has been proposed and evaluated for the simulation of the mechanical tests required for panels and doors. Based on acoustic and mechanical simulations, a set of 'acoustic enhanced multi-layered panel' designs were proposed and analyzed.
- ◆ Appropriate engineered wood materials were selected and wood polymer composites with supreme strength properties were developed, based on simulation as well as compared with experimentally developed wood-PP composites, in order to achieve a light and efficient acoustic panel. Tests have been performed in order to determine its sound absorption properties per thickness. The ecotoxicity was evaluated as negligible.
- ◆ A range of materials have been identified, manufactured or obtained, in readiness for prototype manufacture of door systems. Two different door prototypes have been developed and tested to date; the compatibility of materials has been evaluated for the whole door system assembly.

Numerical simulation

Computer simulations based on Finite Element Method has been conducted at two different scales.

Starting from microstructural characterization, equivalent mechanical properties of different composite materials are predicted for different material combinations and filler content ratios.



These equivalent material properties are then implemented in an acoustic simulation in order to predict acoustic behaviour of complete door system at macrostructural level.

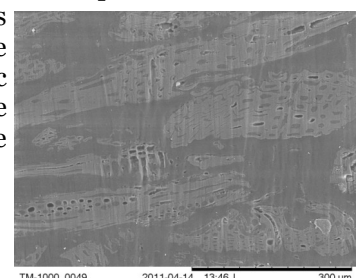
Additionally it has been conducted several thermal simulations for different configurations in order to evaluate heat transfer through the whole panel structure.

WPC extrusion for high acoustic performance

The balance of fibres and matrix polymers is crucial in the creation of new WPC (Wood Polymer Composite) materials, or more generally speaking, composite panels with any fibre component. The ambition in the project has always been to strive for a composition with the highest possible contents of fibre, without compromising with the internal strength properties.

An upper limit of ca. 70 % wood particles can be achieved in WPCs in special cases, but the extrusion of wide, flat panels is an especially demanding process, and our prototype materials have been limited to 50 % wood.

The optimization of the extrusion parameters consumes a lot of time and efforts, and the time and resource frame of SILENTWOOD has only allowed this to a limited extent. The extrusion produces a partial orientation of the fibers, which gives some differences in the mechanical and acoustic properties in the three principal directions of the composite.



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Tests of the first door prototypes

After testing acoustically and mechanically the different new materials from November 2012 to February 2013, the first prototypes, manufactured by our partners MELU, Mizarstvo d.o.o. and Falegnameria Valsecchi S.A.S. where finally tested in February at Centro Tecnológico de la Madera de Castilla la Mancha (AIMCM) premises.

The tests carried out confirmed the acoustic performances of the materials and structure (target of 37-38dBA of sound reduction reached).

Next step

ARTEMA is now manufacturing the final door prototype, which has been optimised, using the simulation tool. With this prototype, which will be accredited in terms of acoustic and fire resistance performances, the SILENTWOOD Consortium is aiming at 40dBA with a 45mm door thickness.



Figure. Specific wood polymer composite (WPC) developed and tested by SP



Left: Finishing of the door leaf at Valsecchi's premises. Right: Set-up of the door prototype at AIMCM for the acoustic tests.

Dissemination and Exploitation Activities

- ◆ Dissemination in the industrial sector through workshop/presentation at the Associations in April;
- ◆ Increase awareness of the technology on End Users with presence in medias, social network and partners' website;
- ◆ Creation of a SILENTWOOD brand strategy (logo, template);
- ◆ Creation of a video catalogue of the new door (mounting, assembly);
- ◆ Protection of the results (rapid prototyping software, sound reduction materials and innovative multilayered structures);
- ◆ Time-to-market readiness: wall panels and doors manufacturing and integration process study, distribution and marketing strategy.



Nyheter från
SP Träteknik



Consortium Meetings (2012-2013)

In addition to several technical meetings, 3 official Consortium meetings have been organized in the year 2012-2013:

- ◆ 3rd Meeting of the SILENTWOOD Consortium, 26th of January 2012, in the Chamber of Commerce, Ljubljana, Slovenia
- ◆ 4th Meeting of the Consortium, 8th of November 2012, at

AIMCM, Toledo, Spain

- ◆ 5th Meeting of the Consortium, 12th of March 2013, at AIMCM, Toledo, Spain

Next meeting

Last meeting of the SILENTWOOD project will be hold in June 2013 at Valsecchi Falegnameria SAS premises, in Cagno, Italy.



Consortium Members



**Tecnologías Avanzadas Inspi-
ralia, Spain**

<http://www.inspiralia.com/>



**Asociación Empresarial de In-
vestigación Centro Tecnológico
del mueble y la Madera de la
region de Murcia, Spain**

<http://www.cetem.es/>



**Wood Based Panels Producers,
Poland**

<http://www.sppd.pl/>

Lesarski grozd
Wood Industry Cluster

Wood Industry Cluster, Slovenia
<http://cluster.sloles.com/>



**SP Sveriges Tekniska
Forskningsinstitut AB, Sweden**

<http://www.sp.se/>



**Centro Tecnológico de la Madera
de Castilla la Mancha, Spain**

<http://www.portalmadera.net/>



**Falegnameria Valsecchi S.A.S.
di Valsecchi Roberto e C., Italy**

<http://www.valsecchisas.com/>



...za vas ...for you ...für sie

MELU, Mizarstvo d.o.o., Slovenia
<http://www.mizarstvo-selisnik.si/>



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