



PROJECT FINAL REPORT

FINAL PUBLISHABLE SUMMARY REPORT

Grant Agreement number: 243639

Project acronym: SILENTWOOD

Project title: MULTILAYERED WOOD-BASED EXTERIOR DOORS WITH ENHANCED ACOUSTIC INSULATING PROPERTIES FOR DWELLINGS, SANITATION AND EDUCATIVE CENTRES

Funding Scheme: FP7-SME-2008-2

Date of latest version of Annex I against which the assessment will be made:
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Periodic report: 1st 2nd 3rd 4th

Period covered: from 01/05/2012 to 30/04/2013 (3rd year)

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**DECLARATION BY THE SCIENTIFIC REPRESENTATIVE OF THE PROJECT
COORDINATOR**

I, as scientific representative of the coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate):
 - has fully achieved its objectives and technical goals for the period;
 - has achieved most of its objectives and technical goals for the period with relatively minor deviations¹;
 - has failed to achieve critical objectives and/or is not at all on schedule².
- The public website is up to date, if applicable.
- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 3.6) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 5 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: Pablo Gamallo

Date: 26/ 06/ 2013

Signature of scientific representative of the Coordinator:

¹ If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

² If either of these boxes is ticked, the report should reflect these and any remedial actions taken.

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1. EXECUTIVE SUMMARY

Nowadays, the European manufacturers of wooden products for construction – more than 100,000 companies, employing around 2.7 million workers in the EU-27 – are struggling to survive. Their complex situation is due to 3 main factors:

- **Societal growing awareness on the effects of noise** on health and quality of people's life, at home, at work, at school and during leisure time. It directly weighs on the construction of private housing and public infrastructures;
- **Strengthening, from the European Union, of the legislation concerning acoustic and noise exposure in construction:** This appears via new regulations in the European normative constructions and the national building codes;
- The **current solutions, based on thicker material are too expensive** (average 400–2,500 €/unit). However, cheaper solutions are available in the US, Australia and China that could threaten the EU market in the coming years.

This critical situation, aggravated by the present economic crisis, is directly reflected in the continuous loss of market quota and the negative exterior trade rates (negative balance between imports and exports is 9%) of the European industry of wooden products for construction, mainly door manufacturers. Besides door manufacturers, panel manufacturing providers are suffering identical issues.

The SILENTWOOD products provide price-competitive, certified wooden-based panel & door applications, with enhanced acoustic performances. These innovative products, which comply with all the international standards (thermal, mechanical, fire-proofing properties), address directly the needs of the collective of door and panel manufacturers.

The developed SILENTWOOD doors feature:

- ✓ Certified acoustic performances above 37dB;
- ✓ Certified fire resistance EI30;
- ✓ Compliance with the main mechanical and thermal requirements (e.g. European Building codes) for doors dwellings, educational and sanitation premises;
- ✓ Environmental friendly materials;
- ✓ Weight below 90kg;
- ✓ Retail cost below €500-600.

Moreover, the manufacturing of the SILENTWOOD products use the existing industrial techniques and tools, allowing a quick and efficient production and availability on the market.

In summary, SILENTWOOD, with its high acoustic and mechanical performances and its reasonable cost, has **all the assets for a strong penetration in the medium/high quality door & panel application market.**

Moreover, it is foreseen that after further development and selection of Fiber Composite materials, SILENTWOOD could offer a 100% bio-based solution, having then a unique positioning in the market

2. SUMMARY DESCRIPTION OF PROJECT CONTEXT AND OBJECTIVES

The SILENTWOOD project is about developing and validating a novel, price-competitive, certifiable exterior wooden-based door with enhanced acoustic performance to attend the growing demand and comply with increasingly stringent building legislations for residential, educational and sanitary premises. It is based on an innovative multilayered structure containing new noise reduction materials and attenuating internal geometrical design.

The purpose 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 at European level while, at the same time, opening them the door to new market opportunities to help them face their current critical situation.

The purpose of the SILENTWOOD project can be divided into two general objectives:

1. **Develop the sound-insulating sandwich or multilayered structure**, containing new noise reduction materials and designing an innovative attenuating internal geometry;
2. **Design, test, validate and certify the door full system** (door or panel, frame and fixing elements), firstly using computer models for optimization and rapid prototyping purposes, and secondly carrying out standardised tests.

In terms of **technical objectives**, these are the requirements to comply with:

- ✓ Comply with the most restrictive acoustic requirements in national building codes in Europe for doors at dwellings, educational and sanitation premises (index of sound reduction, weighted A, above 30 dBA, trying to get 40 dB);
- ✓ Thermal insulation and fire-proofing requirements in these codes at European level (thermal transmittance, U-value, below 1.6 W/m² K);
- ✓ Mechanical requirements (dimensional and structural stability, torsions, others obliged by the normative);
- ✓ Fire-Resistance certification (EI30, trying to reach EI60/90);
- ✓ Light weighted (60 – 90 kg) and not expensive (€400 – 500 production cost);
- ✓ Moreover the fabrication of these doors will use the techniques, tools and equipment existing in the market. Therefore the market penetration will be easy and quick.

3. DESCRIPTION OF MAIN S & T RESULTS/FOREGROUNDS

The actual developments obtained for each result after the execution of the SILENTWOOD project have been:

1. SOUND-INSULATING SANDWICH OR MULTILAYERED DOOR, CONTAINING NEW NOISE REDUCTION MATERIALS AND DESIGNING AN INNOVATIVE ATTENUATING INTERNAL GEOMETRY

The combination of the use of a novel engineered wood (Result 3) with an innovative multi-layered structure (Result 2) has been successfully tested with prototypes (2 panel and 4 door prototypes) and its performances evaluated. The solutions, using material combination of Fiber Composite fibre panels, absorbent materials and high density sheets and an optimized multi-layered structure, complies with the sector requirements (mechanic/thermal/fire-resistant), weighing less than 90 kg, having a thickness of 45mm, and with a sound reduction above the initial requirement of 30 dB (reaching above 37-39 dB).



Figure 1 – Set up of the SILENTWOOD door for acoustic performance certification

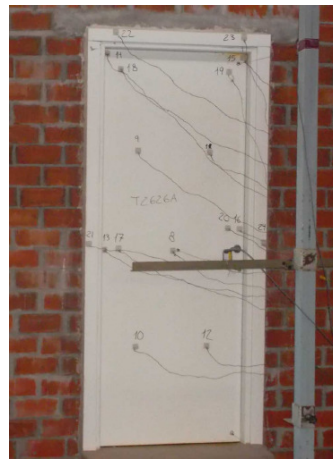


Figure 2 – Set up of the SILENTWOOD door for Fire Resistance certification

2. INNOVATIVE MULTILAYERED STRUCTURE

Various structures were evaluated (e.g. honeycomb, spikes, omega shape). The structure with the best performance and manufacturing possibilities was selected, improved and adapted to manufacturing/assembly conditions. Different prototypes, using variants of design and materials preliminary assessed and evaluated, were manufactured and tested.

3. COMPOSITION OF THE NOVEL ENGINEERED WOOD

Materials have been evaluated in laboratory tests and modeling procedures, based on the properties and characteristics of a large number of plastics, natural fibers, inorganic fillers. From experimental data and simulations, the best performing material combinations were selected to be processed into door structures (according to acoustic, mechanical, fire testing, and industrial consideration [material price, quality, industrial processes]).

4. CAE MODULE TO SIMULATE NOISE TRANSMISSION THROUGH MULTISTRUCTURED PANELS AND DOOR INTEGRAL SYSTEMS AND TO ENABLE A FUTURE RAPID PROTOTYPING SOFTWARE

A customized Computer Aided Engineering (CAE) module has been developed to simulate noise transmission through multistructured panels and so evaluate the panels' acoustic performances, along with its mechanical properties. The simulation module has allowed the Consortium to reduce drastically the trials performed in laboratory, the module showing high accuracy compared with reality (i.e. validation through comparison with actual data and the results of the trials with the prototypes).

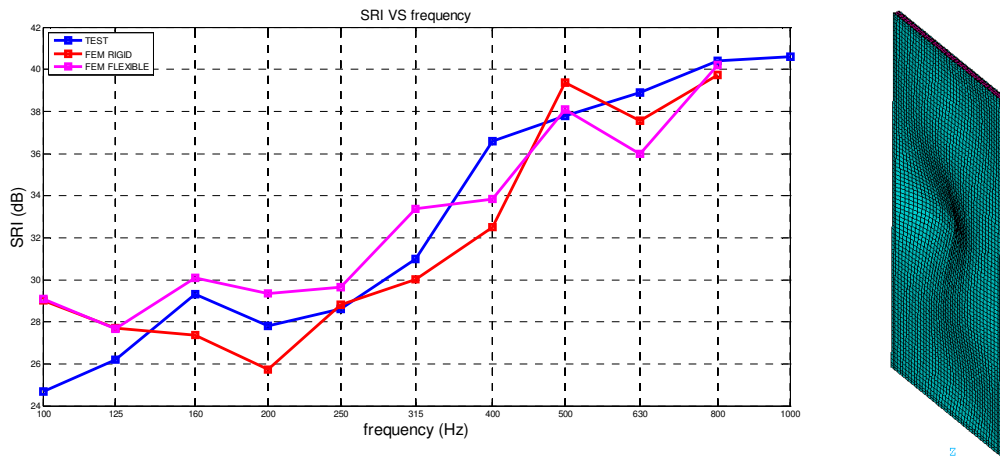


Figure 3 –CAE module to assess door/panel design acoustic performances (the Sound Index Reduction diagram of the door is shown above)

4. POTENTIAL IMPACT AND MAIN DISSEMINATION ACTIVITIES AND EXPLOITATION RESULTS.

POTENTIAL IMPACTS

There are number of benefits that will be provided by SILENTWOOD, and these include:

1. Increase of competitiveness of door and wood panel SME manufacturers

The SILENTWOOD innovative and competitive technology will enable the association partners and the SME manufacturers of doors and wood panels to penetrate the medium/high quality door/panel application markets (estimated at 100 million doors/panels per year in Europe and 200 million in USA/China).

2. Economic support and sustainable growth of rural regions

The wooden-based door sector is composed in majority of SMEs which are located in less industrialised areas, playing a major role in rural development. The SILENTWOOD products, which are high performance, cost-effective and comply with the most exigent international regulations, will provide a sustainable growth to these small companies and bring economic wealth and work to rural regions.

3. Reduction of health issues resulting from noise

It is estimated that 25% of homes are affected by noise problems. SILENTWOOD doors and panels, thanks to its high acoustic insulation performances, will prevent the populations to suffer from noise related illness and sleep disturbances (potential effects: cardiovascular, respiratory and musculoskeletal disorders).

4. Environmental products

In addition not to use traditional metals – which are non-renewable –, the SILENTWOOD product are environmental friendly, focusing on partially and completely bio-materials, low footprints and energy consumption, and low impact on the environment.

DISSEMINATION ACTIVITIES

All the members of the consortium have contributed to the dissemination according to their capabilities and own means, whether it has been by giving presentation, participating in conferences/workshops, publishing papers, articles, networking or similar activities.

The SILENTWOOD dissemination has been structured as follows:

- **SILENTWOOD Presence/Presentations in the main furniture, construction and other relevant fairs** (in participated countries and other countries with potential markets). Among others:

- April 2013: DREMA Interational Trade Fair of Machines and Tools for Woodworking and Furniture Industries, Poznań, Poland
- April 2013: Innovawood & UNECE/FAO, "Innovation in the Forest-Based Sector – Prerequisite for the Green Economy", Geneva, Switzerland
- March 2013: Fair Dom, Ljubljana, Slovenia

- January 2013: International Construction Fair, including the WinDor Fair, Poznań, Poland
- October 2012: MADE EXPO Milano, Italy
- May 2012: Construtec 2012, Madrid, Spain
- April 2012: 51st Milan International Furniture Exhibition: “Salone del Mobile”, Milan, Italy
- April 2012: International Building Fair, Brno, Czech Republic
- March 2012: Fair Dom, Ljubljana, Slovenia
- February 2012: Bautech Fair, Berlin, Germany
- January 2012: BUDMA - Building Trade in Poznan, Poland
- January 2012: Swissbau Fair, Basel, Switzerland
- September 2011: 5th International Symposium on Wood Fibre Polymer Composites, Biarritz, France

▪ **SILENTWOOD website** <http://silentwood.eu/>

SILENTWOOD website – launch followed by regular updates – to describe the project, the Consortium and promote its progress and results to its targeted audience.

▪ **Presence on the website of all the partners**

- Presence on the different project partners (+ link to SILENTWOOD website),
- Announcements of project progress on the web pages of SME-AG, SMS and RTD performers.

▪ **Articles/announcements about SILENTWOOD progress and results** in scientific journals, general and vulgarisation media (e.g. CIM, LESWood)

▪ **Promotion and dissemination materials** (brochures [x2], posters [x2], newsletters [x2], bulletins...)

▪ **Communication to Associate members** (for WIC, CETEM and SPPD)

▪ **Direct communication with End users** (via email, workshops, linkedIn...)

▪ **Commercial positioning** (preparation SILENTWOOD Brand for Trademark registration)

EXPLOITATION OF RESULTS

The SILENTWOOD Associations (WIC, SPPD and CETEM) have defined the following strategy to be able to address the targeted door & panel application markets quickly and successfully:

1. Consolidation of the Supply Chain

The SILENTWOOD supply chain needs to be properly defined as it involves not only the SME manufacturers but also all the specific raw material and bonding/adhesive that is generally not used by the End Users. In this regard, the Association will coordinate, with the SME End Users, the consolidation of the raw material suppliers as the 3

associations have a wide network in their respective country. Besides, they will also train and assist their associate members who are willing to enter the SILENTWOOD supply chain.

2. Preparation for commercialization

One of the focuses during the last year of the project has been to uniform the different dissemination materials in order to create a complete SILENTWOOD image and brand. The definition of the SILENTWOOD image through an updated Logo, a slogan (“*Novel Acoustic Performance*”) and specific colours was the first step for the creation of the SILENTWOOD Trademark, before its registration.

From then on, with the end of 2013/beginning of 2014 as target (with the participation of international fairs in the construction sector such as Milan MADE EXPO, Poznan BUDMA-International Construction Fair or Barcelona CONSTRUMAT) the following actions will be carried out:

- **Preparation of the common design of SILENTWOOD products (doors, panels);**
- **Manufacturing of 1-2 SILENTWOOD finished door products.** The doors will incorporate the SILENTWOOD trademark on their wings, as additional recognizable branding. The Association and the SME manufacturers are currently organizing this production and coordinating the necessary of special material purchase;
- **Design of a new commercial web-platform SILENTWOOD.** The website address www.silentwood.eu will be kept, but the whole FP7 project website will be move in a specific section of the website (under R&D project / research and technical work);
- **Preparation of a generic template for the SILENTWOOD products** to be added in the catalogue of the manufacturers (ARTEMA, MELU and VALSECCHI to begin with) and used by the Associations for marketing.
- **Evaluation** of the different countries tax benefits, environmental incentives and interesting ecolabels (e.g. German Blue Angel, Nordic Swan) concerning doors/panel in order to adapt the marketing offer/speech to the targeted clients.

3. Funding & Investment Plan

In order to anticipate the SILENTWOOD launch and the important injections of liquidity to pay for the production adaptation, new raw materials (stocks, supplier search...), and launch activities specific to new product (packaging, promotion/publicity expenses...), the Association partners have studied the potential funding and investment schemes that they could use. For the moment, the Associations have identified, listed and started contacted the following:

- ✓ The European Business Angel Association (EBAN), to help identify a specialist service provider to represent their case in business angel communities;
- ✓ The European Investment Bank;
- ✓ Other international/institutional actors (e.g. Société Générale Asset Management, Imperial Innovations).

5. ADDRESS OF PROJECT PUBLIC WEBSITE AND RELEVANT CONTACT DETAILS

5.1. Consortium Members

PARTNER	SHORT NAME	COUNTRY
Tecnologías Avanzadas Inspiralia	ITAV	Spain
Spanish Confederation of Woodworking Industries	CETEM	Spain
Stowarzyszenie Producentow Plyt Drewnopochodnych w Polsce	SPPD	Poland
FALEGNAMERIA VALSECCHI	Falegnameria Valsecchi	Italy
Artema Puertas S.A. (ARTEMA)	ARTEMA	Spain
SVERIGES TEKNISKA FORSKNING SINSTITUT AB (SP)	SP	Sweden
ZAVOD LESARSKI GROZD (WIC)	WIC	Slovenia
Centro Tecnológico de Castilla La Mancha (AIMCM)	AIMCM	Spain
Melu Mizarstvo d.o.o. (MELU)	MELU	Slovenia

5.2. Project Contact and Logo



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