WET-LAID TECHNOLOGY IMPLEMENTATION IN REVALORIZATION OF SOLID WASTES GENERATED IN URBAN OR INDUSTRIAL ENVIRONMENTS.

- ATHENS 2014 -

Athens2014

Research Group on Materials and Sustainability
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Aitex Headquarters, Alcoy (Spain)

2008: Aitex technical offices located in 3 countries
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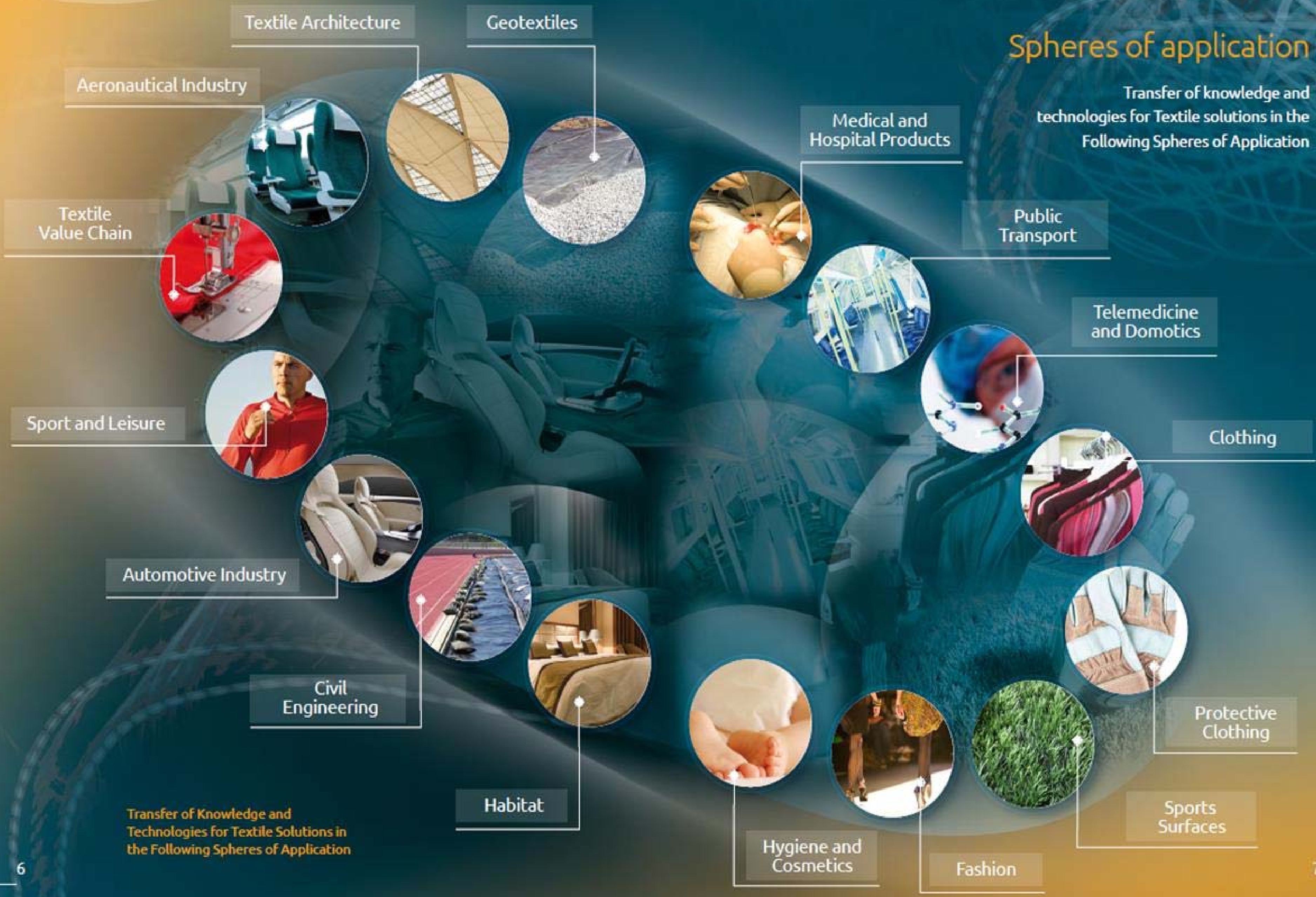
Spheres of application

Transfer of knowledge and technologies for Textile solutions in the Following Spheres of Application



Transfer of Knowledge and Technologies for Textile Solutions in the Following Spheres of Application

R & D – WET-LAID TECHNOLOGY



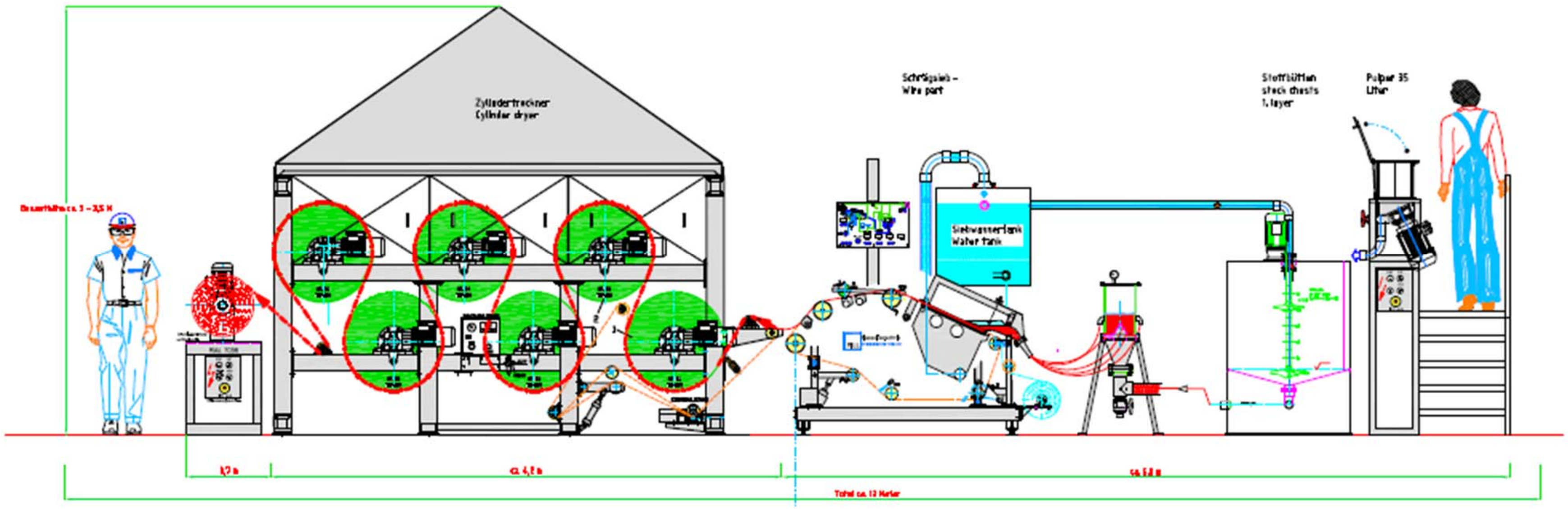

1. BASIS OF WET-LAID TECHNOLOGY

2. EXPERTISE IN BIOCOMPOSITES DEVELOPMENT

3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

4. CONCLUSIONS

1. BASIS OF WET-LAID TECHNOLOGY



Wet-laid technology is based on a nonwoven production process in which the textile fibres are suspended in an aqueous medium, and are then deposited on a conveyor belt that carries the nonwoven sheet to the consolidation station.

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1. BASIS OF WET-LAID TECHNOLOGY

FIBRES PREPARATION


FIBRE PRE-DISPERSION


FEEDING TANK

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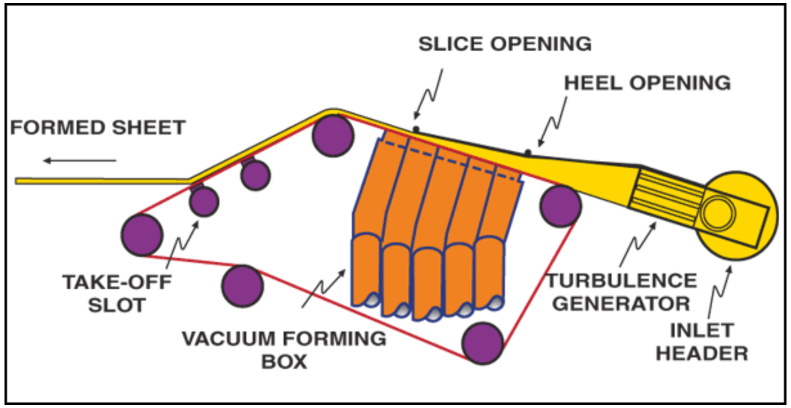
1. BASIS OF WET-LAID TECHNOLOGY

WET FORMATION OF THE VEIL



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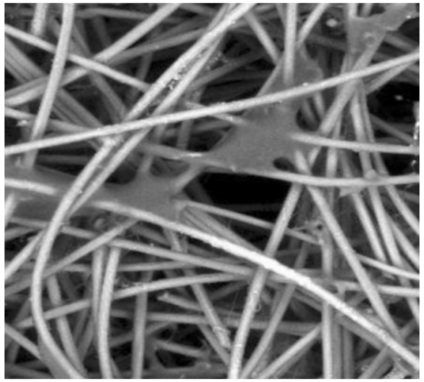
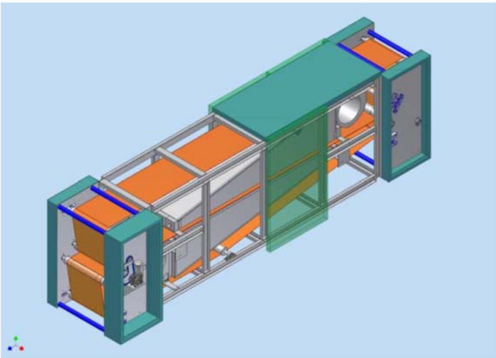
1. BASIS OF WET-LAID TECHNOLOGY

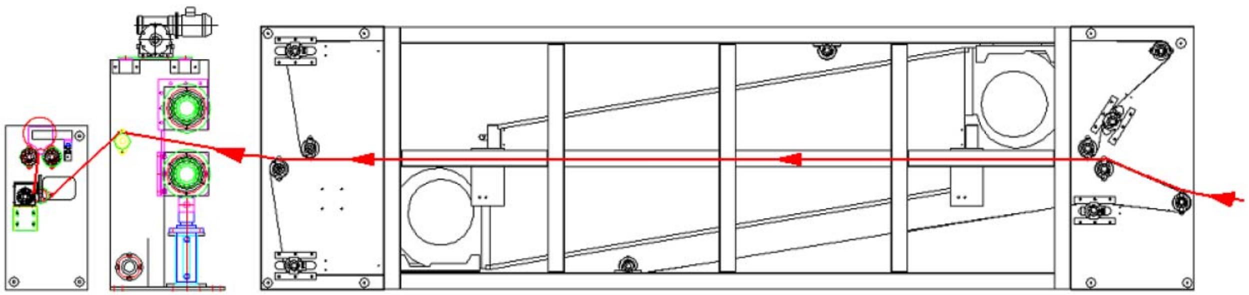
NONWOVEN CONSOLIDATION

THERMAL CONSOLIDATION

The bonds between the fibers of the nonwoven are generated by the action of the temperature inside the drying module, through the fusion of the thermo-melting fibres in the veil.







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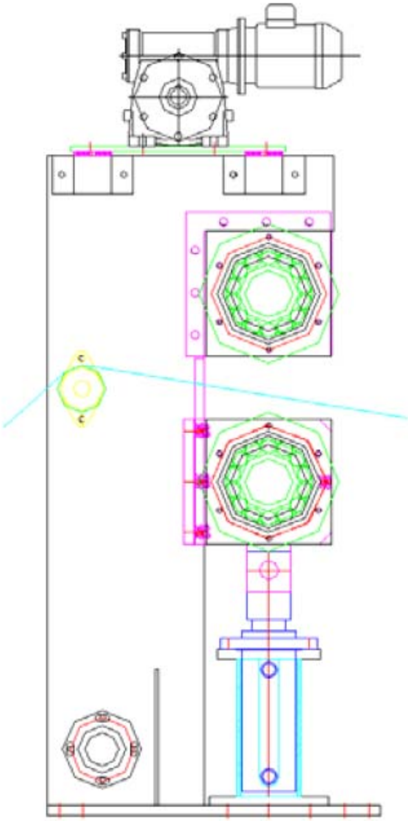
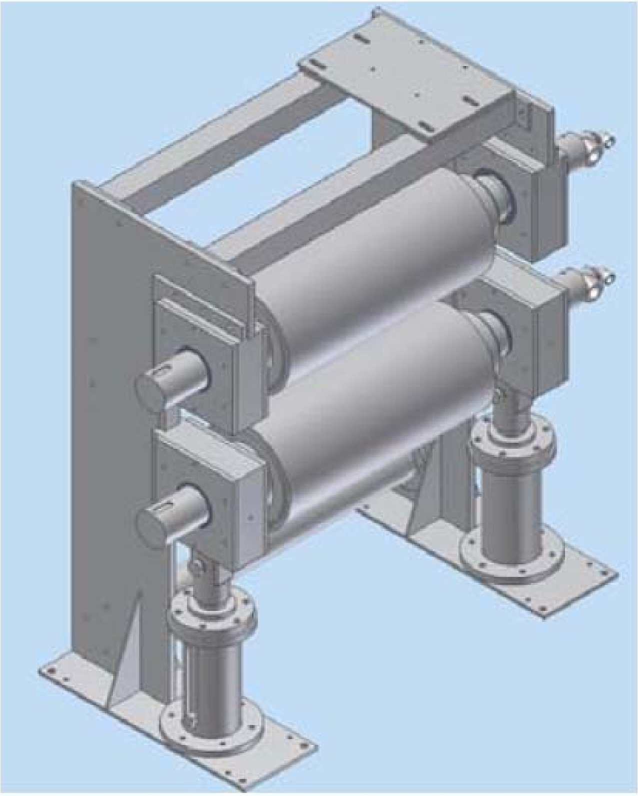
1. BASIS OF WET-LAID TECHNOLOGY

FINISHING OF NONWOVEN: CALENDERING





1. BASIS OF WET-LAID TECHNOLOGY

NATURAL FIBRES

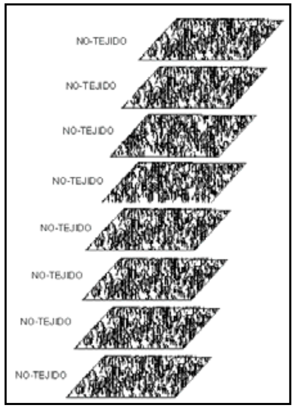
TECHNICAL FIBRES

ORGANIC WASTES

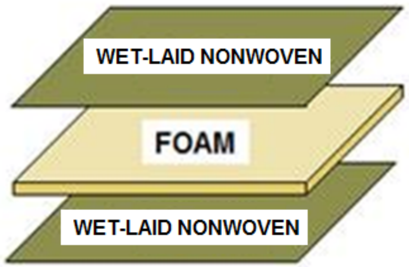
TEXTILE WASTES

2. EXPERTISE IN BIOCOMPOSITES DEVELOPMENT

WET-LAID + COMPRESSION MOULDING



WET-LAID + INJECTION MOULDING



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3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

This work is part of the project 2011 LIFE11 ENV/E/000600: SEAMATTER-“Revalorization of coastal algae wastes in textile nonwoven industry with applications in building noise isolation” funded by the LIFE+ programme.

- CLEANING, DRYING AND CRUSHING
- DEVELOPMENT OF NONWOVENS
  - WET LAID TECHNOLOGY
- CHARACTERIZATION OF NONWOVENS
- DEVELOPMENT OF BIOCOMPOSITES
  - PRESS MOULDING THECHNOLOGY
  - INJECTION MOULDING THECHNOLOGY

3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

WET-LAID NONWOVEN BASED ON POSIDONIA ALGAE WASTES

POSIDONIA ALGAE WASTES

Reference	Description	Average length (mm)
G1	Fine grain Posidonia wastes	1 mm
G2	Medium-grain Posidonia	1,4 mm
G3	Coarse-grain Posidonia	4,40 mm


G1


G2


G3

FIBRES

Property	Lyocell Fibre	PLA Fibre
Cut length (mm)	4	6
Fibre coarseness	1,7 dtex	1,3 dpf
Melting point (ºC)	---	168/170
Degradation point (ºC)	190	---


Lyocell fibre


PLA fibre

3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

WET-LAID NONWOVEN BASED ON POSIDONIA ALGAE WASTES

POSWS-G1

POSWS-G2

POSWS-G3

Reference	Material	Composition % (p/p)
POSWS-G1	Posidonia oceanica waste fibre G1	70
	Lyocell fibre	20
	PLA fibre	10
POSWS-G2	Posidonia oceanica waste fibre G2	70
	Lyocell fibre	20
	PLA fibre	10
POSWS-G3	Posidonia oceanica waste fibre G3	70
	Lyocell fibre	20
	PLA fibre	10

3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

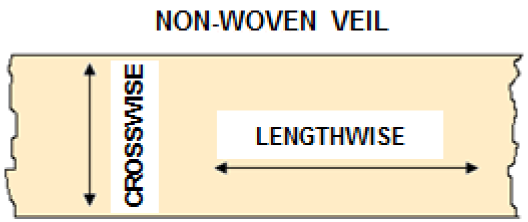
CHARACTERIZATION OF WET LAID NONWOVENS

MECHANICAL PROPERTIES

ISO 29073-3:1993

Textiles. test methods for nonwovens. Part 3: Determination of tensile strength and elongation.

Dynamometer



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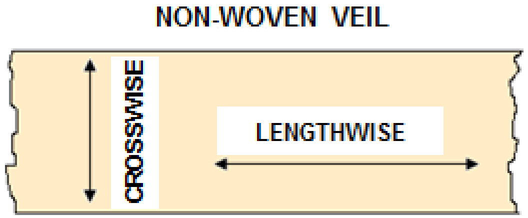
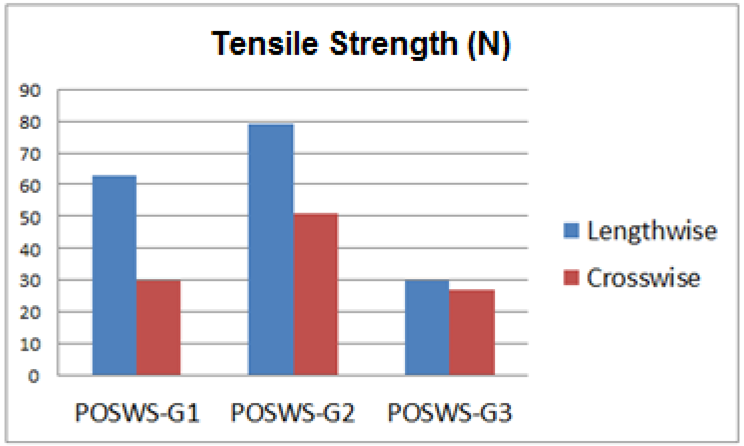
3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

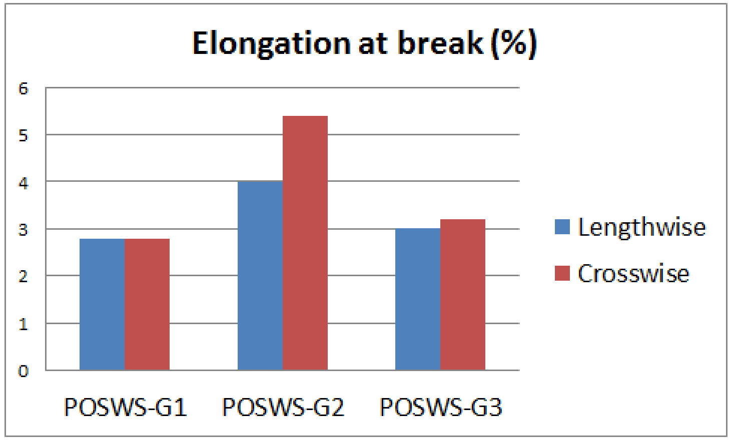
CHARACTERIZATION OF WET LAID NONWOVENS

MECHANICAL PROPERTIES

Reference	Direction	Tensile Strength (N)	Elongation at break (%)
POSWS-G1	Lengthwise	63	2.8
	Crosswise	30	2.8
POSWS-G2	Lengthwise	79	4.0
	Crosswise	51	5.4
POSWS-G3	Lengthwise	30	3.0
	Crosswise	27	3.2







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3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

CHARACTERIZATION OF WET LAID NONWOVENS

ACOUSTIC PROPERTIES

UNE-EN ISO 10534-2:2002

Sound Absorption coefficient in normal incidence (α)

$$\propto = \frac{E_{absorbed}}{E_{incident}} \qquad 0 \leq \alpha \leq 1$$

α close to 0 = worse sound absorbent material
α close to 1 = better sound absorbent material

Impedance Tube (Kundt Tube)

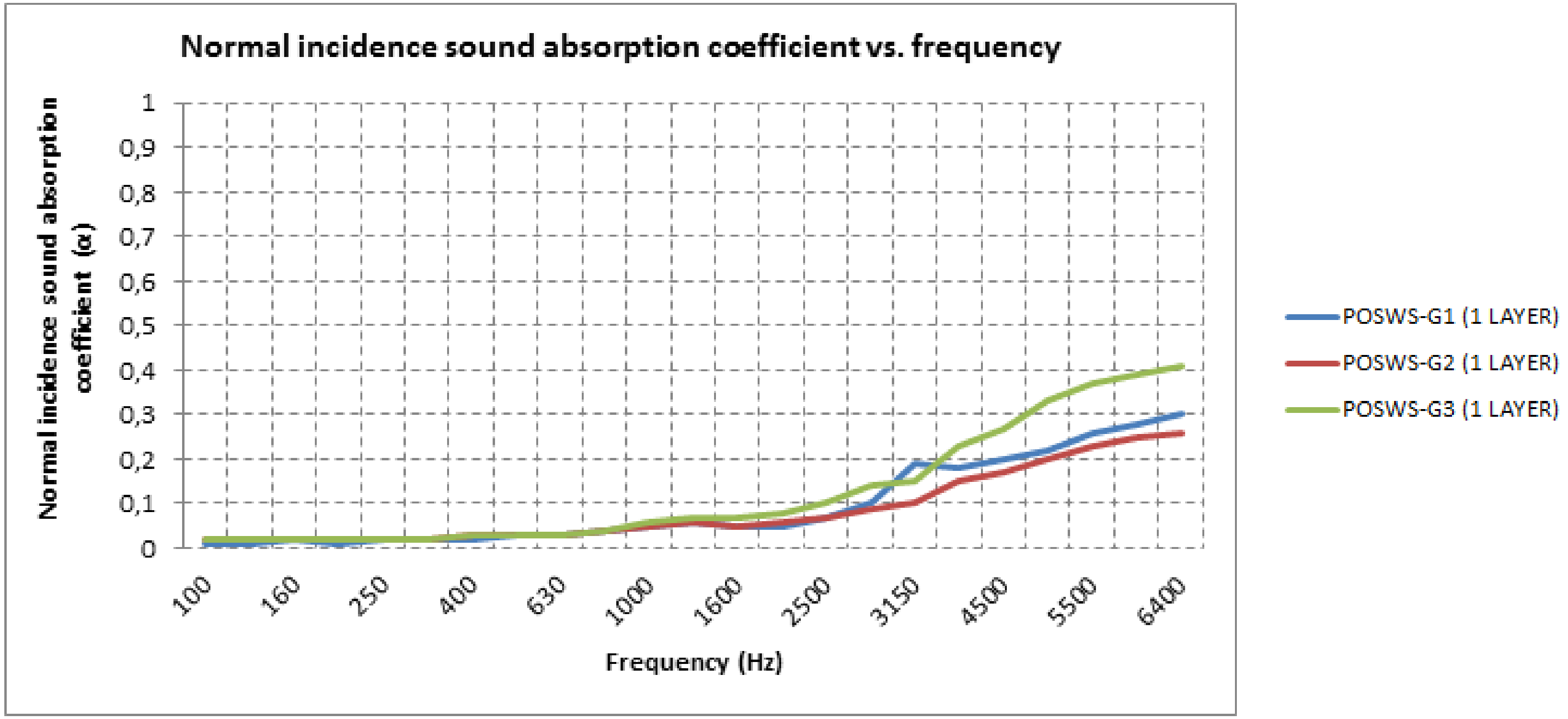
Low Frequencies
50 Hz to 1,6 kHz

High Frequencies
500 Hz to 6,4 kHz

3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

CHARACTERIZATION OF WET LAID NONWOVENS

ACOUSTIC PROPERTIES



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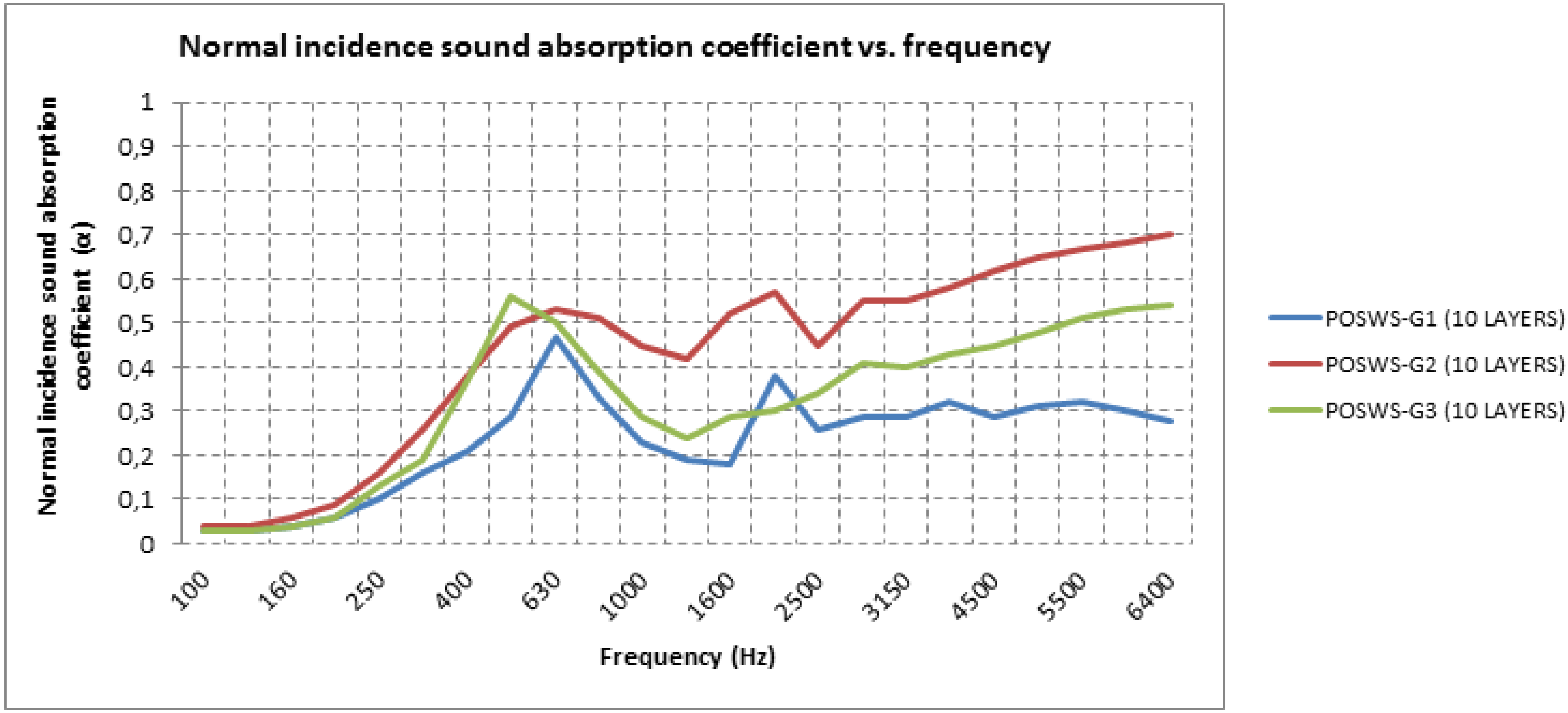
CHARACTERIZATION OF WET LAID NONWOVENS

ACOUSTIC PROPERTIES



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3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

BIOCOMPOSITE BASED ON POSIDONIA ALGAE WASTES

PRESS MOULDING TECHNOLOGY

Pressure	8 Tonnes
Temperature	165ºC
Time	10 min

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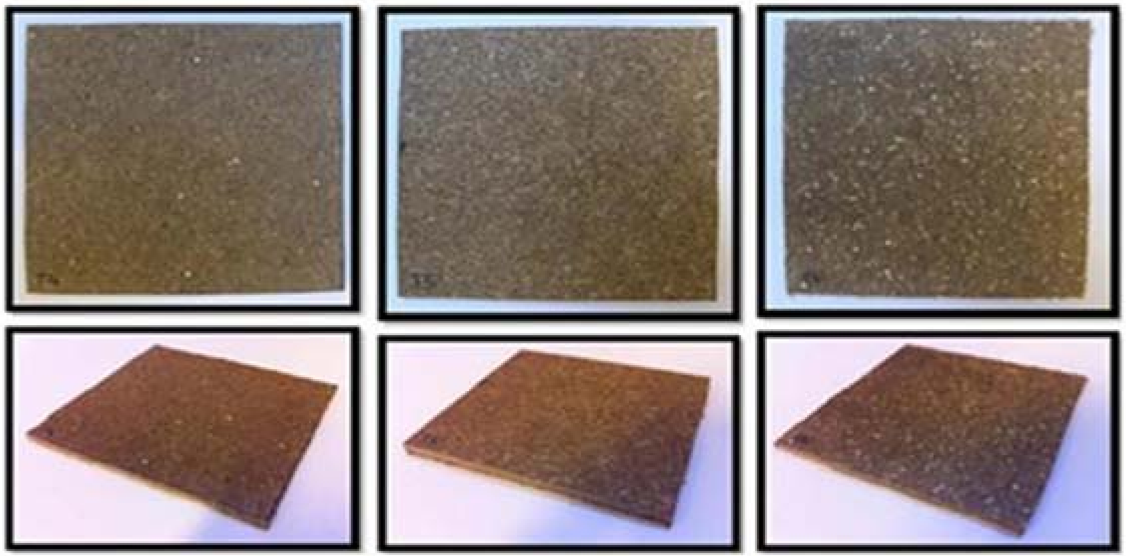
Life

3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

BIOCOMPOSITE BASED ON POSIDONIA ALGAE WASTES

PRESS MOULDING TECHNOLOGY



POSWS-G1 POSWS-G2 POSWS-G3

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3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

BIOCOMPOSITE BASED ON POSIDONIA ALGAE WASTES

INJECTION MOULDING TECHNOLOGY

Cure time	10 hours
Cure Temperature	Ambient Temperature

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3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

BIOCOMPOSITE BASED ON POSIDONIA ALGAE WASTES

INJECTION MOULDING TECHNOLOGY

POSWS-G1

POSWS-G2

POSWS-G3

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3. BIOCOMPOSITES BASED ON POSIDONIA ALGAE WASTES

AGROINDUSTRIAL & NATURAL WASTES PROJECTS

Posidonia Algae WASTES

Textile WASTES

Rice husks WASTES

4. CONCLUSIONS

1. Wet-laid technology allows to obtain technical non-wovens suitable to be implemented in composites manufacturing by means of compression and injection moulding techniques.

2. Very short fibres or even powder materials can be processed using wet-laid technology in order to obtain technical non-wovens.

3. Natural wastes find a huge variety of applications in technical non-wovens development. It is important to identify the optimum binder agent (thermoplastic material to improve the mechanical properties of the non-woven). In addition, chemical treatments with compatibilizing agents could enhance the mechanical properties of non-wovens and subsequent composites obtained based on them.

4. Non-wovens and composites based on natural wastes can be successfully applied as acoustic insulation systems. Anyway, fire retardant treatments should be implemented in these ecological building products.

Centre for research, innovation and advanced technical services for textile, clothing and technical textiles sectors.

THANKS FOR YOUR ATTENTION

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