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BUSINESS SUMMARY

DELIVERABLE D_6.1

TV4NEWOOD PROJECT

AGREEMENT NUMBER: ECO/12/333079/SI2.653690

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This deliverable is a part of project business plan.

The business plan is divided in the following deliverables:

D_6.6 Executive Summary (chapter 1)

D_6.1 Business Summary (and Market analysis summary) (chapters 2 and 3)

D_6.4 Strategy and implementation summary (Chapter 4)

D_6.5 Financial plan summary (chapter 5) and Monitoring (chapter 6)

D_6.8 Fmeca analysis and Exit Strategy Plan (chapter 5)

2. Business Summary

2.1.1 Company Summary

2.1.2 Management Summary

2.1.3 Products and Services

3. Market Analysis Summary

3.1.1 Industry background – EIC Evaluation

3.1.2 Demand point of view

3.1.3 Competitor description

3.1.4 Legal framework

3.1.5 Competitive positioning

3.1.6 SWOT Analysis

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2 Business Summary

Our effort is to design and make available the most green, economic and flexible process for wood modification.

Our actual business vision is addressed to develop both the market segments for drying systems and Thermo Vacuum Treatment. In particular we consider Thermo Vacuum as absolutely strategic innovative solution for developing competitive positioning. Drying market is a mature one, even if wood applications are slightly growing worldwide, but it is characterised by very high competition, specially from the most emerging countries.

The TVW (Thermo Vacuum Wood) produced by our innovative technology might be considered as a "new wood", with high interesting technical characteristics, exceptional green footprint and low cost, able to revamping the local (poor) essences use instead the tropical or more costing ones.

Our strategy is intended to develop market demand for new TVW material, so that Thermo Vacuum machine demand will come consequently. Thanks to the Eco Innovation initiative our effort is addressed to determine process and product characterisation, demonstration and related certification that – at the moment – our technology represent the most environmental friendly process available on the market for wood modification, producing the most ecological treated wood.

Process and products homologation and certification are keystones of our strategy because, making reference to the first draft of the market analysis, our technology appears to be one most able to treat different essences (the others are adopted for one up to three / four essence mostly).

2.1.1 Company Summary

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From the beginning of the 1900s, numerous attempts were made to develop a wood vacuum drying process. Despite all the various studies carried out, the process was never industrialized.
In **1962**, in Turin, Vincenzo Pagnozzi began his original research on the wood vacuum drying process that ended in **1965** with a registered patent.
A company was founded based on this invention and it grew constantly, producing machinery and developing new technologies that generated 89 patents over the first few decades of operation.
In **1972**, Vincenzo's son Ernesto, the firm's present-day owner, began working at the company. Ernesto received an Electronic Engineering degree at the Polytechnic University of Turin and his experimental thesis was based on research involving a mathematical model of wood vacuum drying.
In **1975**, the company acquired an international outlook through its participation in the Hannover tradeshow in Germany, granting construction licenses in Japan and the United States (www.vacutherm.com) and creating a sales organization that presently operates in and serves all continents.
In **1994**, with the birth of **W.D.E.** (**WOOD DRYNG ENGINEERING**), production increased significantly as production processes were optimized, raising the vacuum dryer construction standards to the highest quality levels.
Since its foundation, the company has built more than 5,000 drying systems.
In **1997** this company model merges with the tradition of wood vacuum drying taking the name **WDE-MASPELL**, a leader in the sector, counting over 5,000 customers worldwide.
Since **2000** the WDE MASPELL construction and distribution network on the Chinese market avails itself of the partnership of **G.M.I. TIMBER DRYING EQUIPMENT MANUFACTURING LIMITED** (www.sesione.cn) , directed by Mr. Raymond Yuen.
In **2002**, following the needs of the market, **WDE MASPELL BRASIL** is founded, a totally Brazilian company directed by Mr. Arnaldo Swolkin.
In **2008** WDE-MASPELL technology forms a partnership with the Egyptian market and encounters the **VAC** (www.vac-egypt.com), a company led by Mr. Gehad Zakaria.

In **2012** WDE has patented his technology for Thermo Vacuum Treatment of wood, and in 2014, thanks the support of the European funding the patents were extended to EU/USA/Brazil/China/India/Canada/Republic of Korea. The innovative technology allow wood structural modification by heat treatment made in vacuum conditions.

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Our innovative solution is born to overcome the most critical market barriers for treated woods that are characterising the competitor technologies:

1) final products without odour and/or pollutant residues
2) significantly cost saving
3) flexibility in wood species treatments

Our devices must be over BAT level, high quality manufactured for safe and continuous production warranty, electronically advanced for remote monitoring, control and assistance.

WDE was and still is a very small enterprise with a very fund knowledge in drying and wood treatment, and despite of a worldwide market reference, our entrepreneurial approach remained not "industrial" with an approach to the market very tailored to the customer needs. At our third generational transition of entrepreneurs, we believe is time for change management and for a different competitive positioning at global level. That's one of the reasons why we decided to invest our resources in Eco Innovative programme with the strategic participation of international partners.

First draft of market analysis indicate an extremely interesting opportunity to get in the wood market, supplying TVW able to substitute tropical woods, to catch market share of concurrent alternative treated woods, to be preferred to "normal" non treated woods thanks to higher technical performances for specific applications at an affordable price.

Wood sector have had a strong reduction during the past 5 / 7 years, most due – specially at European level – to the building sector crisis. But the market trends show a recovering situation, and in addition, tropical wood imports are reducing thanks to the restrictive norms adopted at European level. For that reason tropical wood consumption have to be substituted with alternative and local wood products having equivalents technical performances. Moreover TVW is intended to be use in alternative applications where competitors are not present yet, or if they are, with costly and surface treated wooden materials.

Market Segment were primarily identified:

1) Building sector – indoor and outdoor: including claddings, external joinery (windows, doors, fences, landscaping and garden equipment like decking, pavin pools, road equipments, etc. and for indoor: parquet floors, panelling, insulations,

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2) Furniture industry: furnishings for houses, nautical furnishing

Details of market demand at European level is in the market analysis and are under elaboration and based on the market analysis made.

2.1.2 Management Summary

WDE due the recent crisis has restructured his organisation and focused on the core business activities, in fact has outsourced the manufacturing and assembling process to selected suppliers while has invested in internal engineering and project management.

Actual organisation is very flexible and based on very selected skills for core business management.

Organisational Structure is very short and include:

Ernesto Pagnozzi: CEO, Technical Manager and Sales Manager. Electronic engineer, has spent his life in designing and developing new technologies for wood dryers. He has the direct control of main managerial processes.

Umberto Pagnozzi: master degree in Communication, has developed his experience in the WDE company as responsible for Marketing and Communication, in fact he directly involved in website company and project development. He is also involved in project management coordinating relationships between technical department and supplier until commissioning at the customer site.

Matteo Arcangeli: engineer in Science of materials, is Production Manager, he overview the designing activities, the technical purchasing process and relationships with suppliers.

Mauro Morelli: Electronic designer, software programmer, he follows from "cradle to grave" all electronic and software matter related to design and manufacture for dyeing and thermo treatment systems.

Samuel Mostarda: Mechanical engineer, he has 15-year work experience in plants, testing for notified certification body. He is the WDE reference for customer technical assistance and plan maintenance programmes.

Paolo Pierini: bachelor in mechanical design, with over 20 years of experiences in designing of carpentry, structural analysis, numerical simulation in mechanical field

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Marco Giardinieri: bachelor degree in mechanics, he is the Assistance and Maintenance Service Manager. He has matured 4 year of experiences in other mechanical companies with the same role. He is involved in claim and emergency management.

Francesco Salvati: over 25 years of experience matured in administrative and financial field. He is the Administrative and Financial Manager, involved in all export procedures, he has the direct control of bank relationships, payments, and humar resources procedures.

Valter Darbe: master degree at Polytechnic of Torino, has over 25 years of broad managerial and advisory experiences addressed to achieve organisational change management processes. Certified Management Consultant ICMCI (International Council of Management Consulting Institutes) and lead assessor at IRCA and CEPAS. International high management experience in UK (as Quality Group Manager at Daily Mail, Evening Standard, Sunday Evening) and India (market analysis; due diligence and risk analysis; company start up and control by the organisational structure, evaluation, selection and staff and Management recruitment and MBO). He is the Project Manager for the Eco Innovation project.

2.1.3 Products and Services

The project is addressed at manufacture of plants for thermo modified wood production. In particular the business related to TV4NEWOOD proposal refers to a specific treatment under vacuum for wood modification.

The market of dried and/or modified wood, is quite wide and growing overall, due to the need of improving wood characteristics for special applications. In general, wood market requires high quality wood, stiff and durable, for indoor and outdoor uses. To improve of wood performances, wood is submitted to different treatments: some include impregnation or chemical treatments; others prefer thermal treatment with or without chemical additives. In both cases, original wood is modified and mechanical / physical characteristics are improved.

Application of "modified woods" are very different: from outdoor (like cladding, external joinery, road equipment, poles for telecommunication, buildings) to indoor uses (like furnishings and parquets, interior woodworks).

WDE deal with the drying systems for wood modification, and its offer is based on 6 lines of different products, all integrating the wood treatments at different stage and related to the wood drying processes.

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VACUUM DRYING WITHOUT HEATING PLATES (patented)

This type of the drying is performed with cylindrical cell or square cell, operating either with a discontinuous vacuum or continuous vacuum , where heating is generated through ventilation.

ADVANTAGES
- Drying wood stacks with spacer sticks.
- Loading wood stacks with fork-lif.

CAPACITY
From 5 m³ a 100 m³ per cell.

VACUUM DRYING WITH HEATING PLATES (patented)

Based on a cylindrical drying cell operating with heating plates and a continuous vacuum, the updated version includes a pressure system of 10 tons/m² on the wooden boards during cycle (to avoid any wood distortion normally occurring during drying processes)

ADVANTAGES OF THE PRESS MODEL
- improves drying quality
- straightens warped boards
- increases drying speed.

CAPACITY
From 0,3 m³ to 10 m³ per cell

HIGH TEMPERATURE TREATMENT (patented)

It is the most recent development of WDE, referring to the TV4NEWOOD technology. The technology is used for developing chemical and molecular structure changes in wood fibres. This is achieved by high temperature (close to combustion = 180° C - 230° C) and vacuum treatment conditions. The output are treated woods with improved overall performances in terms of stiffness, durability from chemical and bio agents. The technology was developed in collaboration with CNR Ivalsa

ADVANTAGES
- very high performances
- technology perfectly fits with any wood essence
- no chemicals additives
- treatment 50% cost saving compared with best competitor alternatives

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HEAT TREATMENT (ISPM-15)

It is represented by a high temperature dryer supplied with a suitable quantity of probes to measure air and wood temperature which, connected to a PLC control system, enables a simple and intuitive management, to monitor, store and finally print out every cycle performed by the user, in accordance with the regulations ISPM-15 for wood disinfestations.

WOOD AUTO-VAPORIZATION SELF VAPORIZATION

Vaporization is a process that consists in submitting to the action of saturated steam green wood stacked inside a cell, to increase the temperature around 100 ° C, to change the natural colouring of some woody species (e.g. Beech, Cherry, Walnut and many tropical species).
The cell of the WDE-MASPELL vacuum drying, being by nature an absolutely watertight adiabatic chamber, can become an ideal environment where obtaining saturated steam at all temperatures between 60 °C and 100 °C through an environmental management of vacuum and temperature, without the need to inject steam in the cell from the outside, but using the same steam produced by the water extracted from the wood, thus generating a process of self-vaporization, which combines the excellent aesthetic result with a low operating cost and a great operational flexibility.

VACUUM DRYING WITH HEATING PLATES (patented)

Based on a cylindrical drying cell operating with heating plates and a continuous vacuum, to exert a pressure of 10 tons/m² on the wooden boards during cycle (Pagnozzi patent).

ADVANTAGES OF THE PRESS MODEL
- improves drying quality
- straightens warped boards
- increases drying speed.

CAPACITY
From 0,3 m³ to 10 m³ per cel

WDE is – essentially – an engineering company, developing advanced technological solution for wood drying.

WDE also provides maintenance services both direct on site / on demand and via intranet, because all recent dryer devices are integrated with PLC and continuously monitored during production. Maintenance services are provided as after sale service only and include troubleshooting.

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3. Market Analysis Summary

3.1.1 Industry background – EIC Evaluation

Economy

According to the OECD, in many European countries the signs of recovery from the recession is well established, although it is not a development itself but more often a reversal trend enshrining the output from stagnation. Some European countries have growth rates rather well established by many months and there are not opposite signs. These are indicators of confidence recovery that stimulate both consumption and investments. A Market closely related to Industry of Woodworking and building and construction in general. During the previous five years apart in some countries (Switzerland, Germany, Nordic countries) and is assisted in a strong contraction of business volumes with peaks of -90% compared to 2007.

Thus, the wood is used in structures of new buildings, furniture (doors and floors) as well as for restructuring of existing buildings. It is used also in urban and public construction and furniture.

At the global level, the Asian economies are a driving force for Western ones, while USA, and North America in general, have consolidated growth rates also above the forecast.

Industry

Similar to the construction sector, the industry sector of wood in Europe has suffered serious repercussions. In particular, the employment of fine wood, such as the tropical one with intrinsic high-quality features, has experienced declines also after the adoption of European directives that trend to limit their import.
The technology that took benefit from this situation are the ones that enhance the local woods, such as the ones that boost the wood features through its treatment.
During 2014 however, the imports of legal tropical wood have increased again, sign of increasing of general demand, without any decrease of wood demand. At the contrary, we denoted a significant increase of volumes produced and main players' estimates are in constant growth.
At the global level, economies with high growth rates have supported the construction and wood industry. Wood consumption in China has increased further and makes this country's the first World Consumer and the major importer because not able to satisfy the demand with domestic product.

Company

The TV4NEWOOD sees a double opportunity to affect the market of modified wood in various applications. In fact, from the results of the lab tests and the extension of treated essences, two macro distinctive factors emerge for taking a competitive advantage:

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- the possibility to use the heating vacuum treatment several European essences
- the production process and a wood product actually 100% ecologic and cheap

Most competing technologies are concentrated and specialized on the treatment of one species only (usually the radiate pine, common in the northern Europe). During the project, we have successfully tested nine different species, all able to increase - some significantly - the inherent characteristics of the wood base.

The VOC, (Volatile Organic Compound) which measures the presence of volatile particles that gives odour to the wood, is lower than that of virgin wood used as raw material, while in all the alternative products the presence of a characteristic smell is a critical factor.

The process does not add any natural additives or chemicals into the wood, rather it subtracts the liquid components of wood, with a significantly reduced energy intake compared to the competitors' solutions. The plant operator therefore does not have / will not have environmental problems and the service of wood treatment can be sold at much more competitive price.

Compared to treated wood market, WDE stands as engineering company capable of developing advanced high-tech solutions in the treatment of wood. The flexibility of the solution presented by the project TV4NEWOOD allows the treatment of different types of wood, aimed at achieving economies of scope: the choice of wood more aesthetically suitable to the needs of the end-user; choice of wood with functional characteristics more suitable for the purpose; the choice between very species at different cost.

In the while, WDE has developed several project partnerships, creating a sort of supply chain in the HT (heating treatment): technological centres specialized on the process tuning and product certification; trade union of user in the industrial sector, treatment operator and end users with whom experiment our solutions.

3.1.2 Demand point of view

In Europe, the heat treatment is experiencing strong growth in the number of facilities industry since 2007. There are now over thirty handling units Thermal across Europe for an amount of about 320.000 mq/year production.

For understanding background, two market dimension have to be considered:

- overall thermotreated wood market size / demand
- competitor description

here we try to outline the market dynamics considering both not-treated and treated wood and:

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The overall not-treated wood market EU size in still increasing:

	NON TREATED WOOD Production 2014 in M3 x 1000	TREATED WOOD Product & Production Capacity 2001 in M3 x 1000	TREATED WOOD Product & Production Capacity 20013-14 in M3 x 1000
EU Sawn Softwood x 1000m3	96.643	It represent only the 0,05% of overall wood market	It represent only the 0,10% of overall wood market. **In 12 years the demand is doubled.** In the next two years the overall production capacity should be increased of about + 140.000m3
EU Sawn Hardwood x 1000m3	12.463		
EU Softwood Logs x 1000m3	169.985		
EU Hardwood Logs x 1000m3 (partial)	17.538		
Total	**296.629**	**165**	**> 320**

Note 1) The most interesting parameter in evaluating the treated wood production in related to the fact that the growth during last 12 year was determined mainly by three players: Thermovood (increased of about 100.000m3); Accoya (+ 40.000 in 10 years and forecast + 65.00 in next 2 years); and Kebony (+ 20.000 during last 8 years). All the other players failed of not increase at all.

Note 2) In 2001 the overall wood manufacture industry had substantially the same volumes than 2014, after a peack during 2005 -2007 the market decreased of about 30% until 2012, and since it maintains slightly a growth

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Tropical wood imports to the EU

The EU has agreed a voluntary scheme titled the Forest Law Enforcement, Governance and Trade (FLEGT) action plan to fight illegal logging and associated trade. One key element of the plan is to ensure that only legally harvested timber is imported to the EU. The EU legal framework for the scheme is Council Regulation (EC) No 2173/2005 adopted in December 2005 'on the establishment of a FLEGT licensing scheme for imports of timber into the European Community' and a 2008 European Commission implementing Regulation (EC) No 1024/2008 laying down detailed measures for the introduction of the scheme.

Bilateral FLEGT agreements between the EU and various tropical wood producing nations are designed to halt trade in illegal timber, notably with a license scheme to verify the legality of timber exported to the EU. The first agreements to be formally concluded were with Cameroon, the Central African Republic, Ghana, Indonesia, Liberia, and Congo, while negotiations are on-going with Cote d'Ivoire, the Democratic Republic of the Congo, Gabon, Guyana, Honduras, Malaysia and Vietnam; Laos and Thailand are preparing to negotiate.

The value of tropical wood imports into the EU-27 reached a peak of EUR 2.3 billion in 2007, before falling by 14.8 % in 2008 and by a considerably greater amount (– 40.0 %) at the height of the financial and economic crisis, illustrating how the recession hit these high-value imports. There was a modest recovery in 2010 (imports rising by 10.7 %), and almost no change in 2011, when the EU-27's imports of tropical wood were valued at EUR 1.3 billion. The influence of the financial and economic crisis is clear: the value of tropical wood imports into the EU-27 were valued at EUR 9 billion in 2012 and 7.8 billion in 2013.

The countries that are presented in the Table accounted for approximately 80 % of the EU-27's tropical wood imports (in value terms) during the 2000–13 period. The main origin of tropical wood imports in 2013 was Cameroon (20.7 % of the total), follow Malaysia (18.8 %) and Gabon (7.4 %) of total EU imports of tropical wood.

	2002	2003
Cameron	327,4	323,9
Central Africa Rep.	28,5	32,4
Congo	93,7	89,3
Cote d'Avoire	185,4	162,3
Democratic Rep. of the Congo	22,3	22,5
Gabon	205	194,6
Ghana	96,6	90,3
Guyana	1,1	0,6

Tropical wood imports, EU-27, 2002–13

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User and Potential User

Currently the customers of TV4NEWOOD device, as we as for all the WDE products, are small / micro enterprises, mainly joinery, wood dryers, who sales the treated wood to dealers, wood wholesalers / traders. Only few wood wholesalers are directly clients of WDE.

The thermo vacuum wood applications are extremely extensive, and comparable with other thermo treated wood, even if our wood product has a wider potential thanks inner characteristics like “no odour” .

It is extremely important to distinguish between user of thermo vacuum plant and users of Thermovacuum wood (the product of thermo vacuum treatment): current clients of WDE are enterprises manufacturing thermo vacuum wood, which is sold to traders / wholesalers for further machining and produce finished articles (like flooring, decking, doors or windows, etc…).

This difference is important because when considering the most important competitors (Thermowood, Kebony and Accoya) we noticed that clients are big distributors of final product (treated wood), because the business is addressed to selling wood end not plants for its treatment.

Joinery and wood dryers

Small companies, they provide services for third parties, like wood working, wood drying. Their production is on demand and their customers are bigger wood dealers (manufacturers of furniture and supplies for the garden, decking, external and internal design). Normally supplier at local level, they provide a quite small number of customers. Some of them are specialised in joinery supplies like window and doors.

Wholesaler

Suppliers of wood and wood products, like engineered wood, they provide integrated services for end users like wood working and wood treatment, installation and assembling. Some of them have relationship with architects and designer for supplies on demand, they participate at public and private tenders, are supplier of building sector.. The geographical extension of business is much more wider than joineries, and can be at national level.

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3.1.3 Competitor description

The competitive environments with which it interacts technology TV4NEWOOD are:
- The context of the processes changing the wood charactetistics
- The context of wood products

Context of Processes changing the wood characteristics:

General:

Thermal treatment for wood modification exists since several decades. In addition should be considered processes like impregnation with liquids or waxes for different utilisation respect the traditional ones of thermo treated wood (fireproof, durability, etc), for that reason we prefer focus the comparison and evaluation on thermal treatment processes only.

As per deliverable D_2.14, currently 9 competitor were identified for these potential production capacities:

COMPETITOR	**ESTIMATED PRODUCTION VOLUMES IN M3/Y (2014)**
Plato-Process (The Netherlands)	75.000
Rectification process (France)	10.500
Bois perdure (France)	N.A.
OHT – oil-heat treatment (Germany)	5.000
Thermo Wood process (Finland)	150.000
Accoya, (UK)	40.000
Thermowoodex (Latvia)	N.A.
Westwood (USA),	N.A.
Kebony (Norway)	20.000

Main technological characteristics and performances are summarised in table below:

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Technologies Comparison Table

Process Name	Main Technical Charact.s	Process Main Parameters	Cycle Total Duration	Production Costs (1)	Plant Costs	Operational Costs (2)	Thermovaccum Advantages
Plato Wood (Netherland)	2 steps process with intermediate drying operation hydrothermolysis step with a dry curing step	1ST STEP 160-190°C 2ND STEP 170 – 190°C 3RD STEP 190 – 220°C 2.8 MJ/kg 3-5 days 14-16h 170°-190°C	4–5h Intermediate drying about 72–150 h 2ndstep 14 – 16 h Conditioning 48–72 h Total: > 240 h	350 - 500 €	10-15 Million € for a plant of 75.000 m³/Y	about 20 Euro per m³.	Only one step process (no handling needs) Sensibly less expensive Shorter process cycle
OHT-Oil Heat treatment (Germany)	Green wood in oil bath (linen, rape, sunflower oil) Oil absorbency 50%-70%	18 h 200°C	18h mean time	From 265 up to 295 €/m³	450.000 € for production capacity 8500 m3/Y	From 60 up to 90 €/m³	No oil consumption / pollutant No smell Sensibly less expensive
Bois Perdure (France)	process starts with fresh wood, then a fast drying process and heating under steam atmosphere.	200 – 240°C	12–18h	150 – 160 €.	500.000 € for oven of 8 m³, and an annual capacity of 3500 m³	Not known	Sensibly lower H2O consumption No smell
Rectification Retiwood (France)	Nitrogen atmosphere with max 2% of O2 Chilling system water injection based	200°-240°	Drying time: 8-12h Heating: 4-5 h TOTAL: 12-18 h	150 – 160 €.	750.000 € for oven of 8 m3, and an annual capacity of 3500 m³	Not known	No NO2 used Sensibly lower H2O consumption Lower initial investment
Thermowood (Finland)	Steam with 3-5% O2, No pressure Air speed 10m/s	150°-240°C	25-72h	140 – 160 €	250.000€ for 1200 M3/Y up to 1,6 Million € for plant of 18000 M3/Y	Not known	Shorter process cycle Medium High initial investment No smell
Accoya (UK)	Process based on Acetyl use	Not Known	Not Known	Not Known	Not Known	Not Known	Smell of Acetyl and few essences treated. Only

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							Pine essence
Thermowoodex (Latvia)	Vacuum	160 – 220°C	From 6 to 24 days depend on wood and tikness	Not known	Oven between 5,5 mt and 11,5 mt leght	Not known	Pine and Oak
Westwood (USA)	No Vacuum 3-D Technology convection dry kilns	160 – 220°C	12-16 hours	Not known	12 m³ one full loading.	Not known	Ash and Oak
Kebony (Norway)	No Vacuum Impregnation with bio based liquid	100 °C	Not known			25 x 150mm Decking Smooth 2 sides, 100% PEFC 20 euro	Maple, Syp, Pine Radiata, Scots Pine
Thermovacuum (Italy)	Vacuum No gas No air No water Only one cycle	160 – 220°C 48 H	24 hours	100 -110 €	350.000 € for oven of 8m³, and an annual Capacity of 1200 m³	From 25 up to 35 €/m³	Silver Fir Spruce White Ash Turkish Oak

Some technologies are protected by patent or trademarks:

Trademark/Patent

Process Name	Trademark	Patent
Plato Wood (Netherland)	Plato ®	Applied in 1989
OHT-Oil Heat treatment (Germany)		
Bois Perdure (France)		
Retiwood (France)		
Thermowood (Finland)	ThermoWood® EU trademark number 000922765 ThermoHout® EU trademark number 004296331	• EP0695408 • JP 3585492 • US 5,678,324 • CA 2,162,374

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Accoya (UK)	Copyright © Accsys Technologies 2015, Accsys Technologies is a trading name of Titan Wood Limited. ACCOYA® and the Trimarque Device are registered trademarks owned by Titan Wood Limited and may not be used or reproduced without written permission	• Australia No 2005212139, • Canada No 2556438, • Chile No 45.802, • China No 100537163, • ZL 2008 1 0190821.0, Europe 680810, 1718442, • Indonesia No ID P00334463, • Japan No 4629055, • Morocco No 32127, • New Zealand No 531217, 4629055, • Singapore No 163367, • South Africa No 2010/05240, • UK No 2456915, 2474154, 2485945 • US Patent No 8173224, 8512815
Thermowoodex (Latvia)		
Westwood (USA)		
KEBONY (Norway)	Kebony® Kebony® Device	EU PATENTED 3042282 USA

Context of wood products

As alternative of traditional or tropical hardwood.

All above mentioned technologies intend to manufacture high quality wood in alternative to tropical one, exploiting local european wood (more cheap and easy available).

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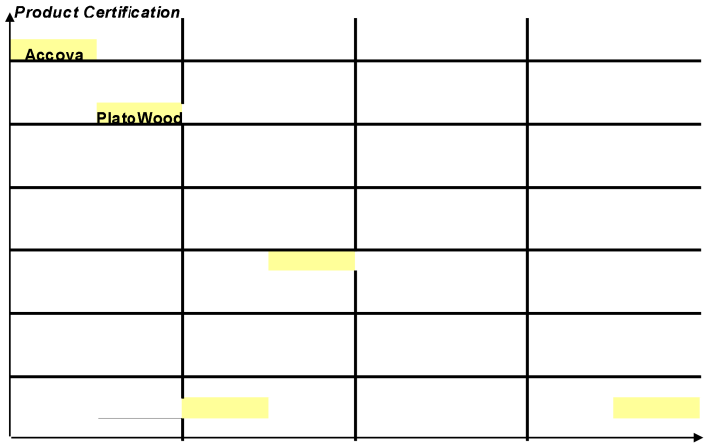
The majority part of competitor are focused on only one essence treatment (more often pine or pine radiate which is the most common tree in the european hemisphere). Another reason for focussing on only one essence is related to the process standardisation and quality certification for final product. In fact – specially the most important and bigger competitors – the traceability of FSC raw material is the most common.	

Product certification is the most desirable tasks for all producers: durability is the wanted and warranted characteristic.

Their product certification situation is summarised in the scheme below:

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Certifications

Process Name	Certification
Plato Wood (Netherland)	• FSC Certificate Plato Wood BV • FSC Commitment Plato Wood BV • FSC Controlled Wood commitment Plato Wood BV • FSC Selfdeclaration Plato Wood BV • PEFC Certificate Plato Wood BV • PEFC Social, Health & Safety Commitment Plato Wood BV • PEFC Commitment Plato Wood BV
OHT-Oil Heat treatment (Germany)	NV
Bois Perdure (France)	NV
Rectification (France)	NV
Thermowood (Finland)	• FFCS (Finnish Forest Certification System) assimilabile a PFC • SFS (some of partners) • Komo certificate (some of partners)
Accoya (UK)	• 3 Part Spec for NA Architects • Certificate of Thermal Performance by IFT, Rosenheim • Certificate DUBOkeur Accoya • Environmental Product Declaration (EPD) • FSC Product Groups • JWPA Certificate • KOMOcertificateAccsys_ENG_01082013 • KOMOcertificateAccsys_NL_01082013 • RAL Certification 2010 • Responsible TImber Purchaser • TTF Membership Certificate • UK Joinery Flyer • Window & Door Manufacturer's Assoc. IS4 Approval • 2241_duurzaamheidspaspoort Accoya_aangepast • Svanen Logo • Accoya C2C Gold Certificate • FSC COC Certificate CU-COC-807363 (valid until 12 july 2017) • PEFC Chain of custody certificate CU-PEFC-807363 (valid until 24 sep 2018) • Singapore Green Label
Thermowoodex (Latvia)	-
Westwood (USA)	-
KEBONY	• FSC-certified

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(Norway)	

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Field of application

All considered technology owners declare that their treated wood products are available for indoor and outdoor uses, but when considering aspects like “odour”, this assertion is true only under condition or with limitation (varnishing of surfaces for instance).

Demand point of view

On the base of the responses obtained thanks to the market survey (questionnaires) some important aspects have arisen:

Main physical characteristics, considered very important:

- durability
- chemical free
- odourless

Main characteristics influencing the “willing to buy”

- product certification
- wood of local provenience (EU)
- free of knots essence availability

Quality and guaranteed products are the main selling points, while price and colour are less essential compared with other characteristics.

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3.1.4 Legal Framework

Description of TVW wood according to the definitions of EN/CEN/TS 15679:2007 Thermal modified Timber

The scope of CEN/TS 15679 is to provide terms and definition of Thermally Modified Timber (§ 3) and of characteristics (§ 5) with references to the standards. This standards also provides a guideline for the assessment of characteristics (§ 6) and marking (§ 7).

Definition of TMT of the CEN/TS 15679 is:
"3.1 Thermally modified timber
Wood at which the composition of the cell wall material and its physical properties are modified by the exposure of temperature higher than 160°C and conditions of reduced oxygen availability. The wood is altered in such way that at least some of the wood properties are permanently affected though the cross section of the timber."
The Thermo-Vacuum Wood totally fits this definition and hence it can be defined a Thermally Modified Timber where the reduced oxygen availability is produced by application of vacuum and some of the wood properties are permanently affected though the cross section of the timber, as determined by the task 4 of the TV4newood project.
Listed definitions of Characteristics that can be affected by the process (and reference to relative standards) are (X: the ones measured in the project):
5.2 EMC X
5.3 Dimensional stability X
5.4 Durability X
5.5 Density X
5.6 Mechanical properties X
5.7 Thermal conductivity
5.8 Bonding
5.9 Coating
5.10 Emission X
5.11 Reaction to fire
5.12 Durability X
5.13 Colour X
The majority of this properties are measured in the project. Moreover in the project is measured the Mass Loss (ML) which is not considered in the standard. We believe that ML is an important indicator of the degree of modification and that it should be included in the next revision of the standard.
The guidelines proposed in the standard for the assessment of characteristics, in compliance with the requirements, concern the sampling (6.2), the factory production control (6.3) and marking (7).

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Such guidelines are essentially a limited version of the ones proposed in "D 2-5 Manual for the standard production of Thermo-Vacuum Wood" which considers a higher sampling and stricter control procedures. In conclusion It can be stated that the description of Thermo-Vacuum Wood accords with the definition of CEN/TS 15679 since it fulfils the following rules and definitions:
· Temperature higher than 160°C during the process;
· Reduced oxygen availability during the process;
· Permanent modification of properties though the cross section of the timber."
· Measurement of the affected properties;
· Control of factory production and marking of timbers.
By a technical point of view* the Thermo-Vacuum Wood is a Thermally Modified Timber produced with a dry process in a open system.

(*according to: Hill, C., (2006) Wood Modification – Chemical, Thermal and Other Processes, Wiley Series in Renewable Resources, John Wiley and Sons, Ltd.)

3.1.5 Competitive positioning

WDE typical client

Who

SME for wood treatment and drying service for third parties.

Reasons for using TV4NEWOOD

TV4NEWOOD technology allows the integration of services with a relatively small investment - still low compared to the competitors' - for the provision of thermally modified wood. Since the system operates under vacuum and there are no consumables (additives, natural resources), operating costs are significantly lower than the competition. The possibility of offering a modified wood expands the range of services and opportunities to open up new segments of the supply timber. The ability to treat a very wide range of wood species allows a flexible response to market trends subjected to fluctuations.
WDE offers in addition to hardware support service, continuous online monitoring system for immediate troubleshooting and/or intervention; support in the management of production processes through knowledge-transfer.

Reasons for NOT using TV4NEWOOD

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It is not yet a well-known technology and currently, there are no certifications of products and processes. Learning a new production process requires training, investment and resources that can't always be guaranteed in a specific context of high competition in a general uncertainty economy. A range of new products, alternative or supplementary to "traditional ones", requires not only technology investments, but above all organizational for the construction of a network of sale, for the preparation of information material and illustrative of samples and of product data sheets. In a general condition of recession or stagnation of European economies, moderate investments by small business owners, are seen very critical and because of difficult access to credit, they are not keen to take risks.
The customer who change the vacuum timber, mainly sells a service contract (at prices determined and controlled by the market) and does not have the organizational, economic, financial skills to sell the product (wood thermally modified vacuum) at highest added value.

Entrepreneur and organizations' profile

These are often reality of small dimensions characterized by turnovers relatively modest (2.5 M €) in which the contribution margins are small because of the strong competition's price. The organization is necessarily very short in the hierarchy, for the containment of overheads. The average educational level is medium/low, often made by first generation craftsmen, with aligned human resources' profile. The markets are local, little with no propensity or ability to internationalization or expansion. The business processes are managed personally by the entrepreneur who may be assisted by a network of agents/dealers. Knowledge of the techniques and technologies of communication and marketing, usually poor (less than 50% of WDE customers in these categories has a website; between those who have it, only about 50% of it in several languages; none of them plays e-commerce). Different companies adopt a strategy of specialization: production of furniture; windows and doors; external cladding. Little or no horizontal integration, product mix very small. They are subject to the market conditions of the market drivers; ROE have low, generally <20%.

Typical clients of competitors:

Who:

They are two big macro-groups, according to the type of competitor:

- competitors similar to WDE
- competitors Accoya – Kebony – Platowood - Thermowood

For similar competitors, the typical clients are similar to WDE's ones, with national features but always SMEs, for woodcraft and drying service for third parties

For competitors Accoya - Kebony – Platowood – Thermowood, the type of customer is made up of large distributors , specialized in the sale of wood of different types (local and tropical ; structural , as laminated engineered and processed). Most distributors integrate the supply of services with woodcrafting semi- finished products such as furniture, kitchens, roofing, siding , both internal and external); the majority has distributors in

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international markets (selling on average in other 3-4 countries) and have branches / agents in other countries. Thus, they have structured organizations with significant business for the market segment in which they operate.

Reasons for using TV4NEWOOD

For distributors, the expansion of high quality products range is important for a competitive development, especially when it corresponds to products with high added-value and with high marginality.
The product Thermo-Wood Vacuum Modified - temporary name by which we identify the result of the production processes application TV4NEWOOD of WDE, it has characteristics fully comparable with those of competitors' , and is also available on many more species. This last feature, beyond to aesthetically and functionally differentiate the offer, also allows to present products in a wide range of prices.

Reasons for NOT using TV4NEWOOD

Major distributors adopt two competitive strategies, not necessarily in conflict with eachother:

- High quality of products (high performance)
- Price policy

The certification of quality of the wood is a feature of the wood sold by major distributors. A product certificate for origin (FSC) and / or guaranteed durability (Accoya 40 years - 30 years Kebony - Thermowood does not guarantee durability - Westwood 15/25 years - Platowood 10 years) is a distinguishing factor of success and attraction to final users. The absence of guarantees vice versa constitutes a reason for not interest into the product. TV4NEWOOD is still a little-known technology, currently with any certifications of products and processes.
A production plant involves the ability to fill the production capacity, to shoulder the burdens of certifications of product / process, to build a brand for marketing. Much more comfortable, flexible and economically less onerous market products to which third parties have already made up for these needs.

Entrepreneur and Organization' profile

They are medium/large-sized organizations: those dealing only in marketing consist of 50 to 250 people; those that integrate services of woodwork from 80 to 700 people (especially in non-EU countries). The turnovers are related (as proportional to the difference in local economies) typically> 30M Euros and may reach and exceed 100 M Euro. Often, they are part of distribution groups or at least they have several factories. They serve mostly only the industry sector, very rarely they sell to the end user, because they usually refer to sales outlets. Normally every major retailer has multiple dealers and representatives in several countries.

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The organizational complexity, the size of the business, the logistics, require a high profile management. The markets are national and international. Knowledge of the techniques and technologies of marketing / communication must be excellent (more than 95% has website in multiple languages, updated and graphically well done). They offer wide timber source from all over the world and a very broad product mix. They are drivers of the market and have positive ROE.

Revenue Structure – Segmentation

Because of previous considerations, it is clear the need to reformulate the strategy in a critical form for competitive positioning.
The primary hypothesis to stimulate the sale of TV4NEWOOD technology through the creation of domestic demand in the market segment has only partial importance in the market analysis conducted so far.
Vice versa, it has a very significant change of perspective if WDE, which owns the basic knowledge of the process of heating treatment under vacuum, considers the opportunity to produce thermically modified timber vacuum for the segment of high distribution markets.
Over the past years, the ROE of WDE (2008-2013) remained between 0.3 and 5%. In 2014, thanks to the boost from the sale of thermo-vacuum systems, it has risen to around 18% (provisional figure).
According to data of Federlegno and ConLegno, aggregated also Databank, the top 10 Italian companies of buildings for woodworking are positioned with ROE values included between 18 and 25%. Values well above the average WDE if we exclude the exceptional year just ended.
The tables below are compared placements WDE in 2009 and 2011 compared to:
- Manufacturers of machines for woodworking (category that is closer also WDE) in 2009 and 2011
- Manufacturers of machines for woodworking which are dimensionally closer to WDE (20 to 50 employees)
The comparison is made in terms of turnover per capita and ROE.
Compared to revenues per capita, that of WDE remains too low compared to the average and also the 10 companies dimensionally closer.
In terms of ROE, WDE is positioned is bad compared to the average of companies in the same sector (dimensionally much larger) and to those closest size.

Positioning scheme.1 ***Turnover per capita - Firms Italian manufacturers of machines for the woodworking / WDE MASPELL in 2009 and 2011***

Legend:

Avarage '09/'11 = average of turnover per capita of first 170 manufacturer of woodcrafting technologies

Orange cells A…B…C, etc= turnover per capita of first 10 Italian manufacturer of woodcrafting with employed >15<50 employed

Positioning scheme 2 **ROE - Italian companies manufacturers of machines for the woodworking / WDE MASPELL in 2009 and 2011**

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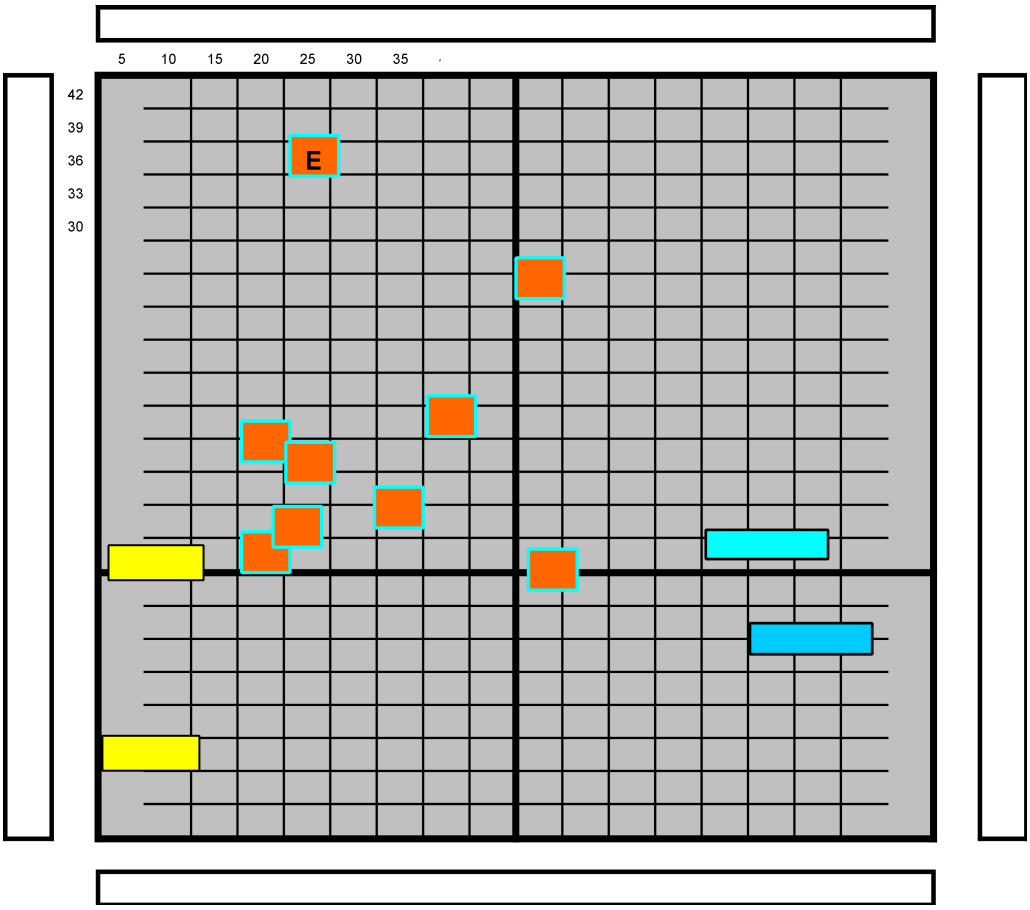
Website: www.tv4newood.it
Email: tv4newood@wde-maspell.it
Phone: +39 (0)744 800672

Legend:

Avarage '09/'11 = ROE of average of turnover per capita of first 170 manufacturer of woodcrafting technologies

Orange cells A…B…C, etc= ROE of first 10 Italian manufacturer of woodcrafting with employed >15<50 employed



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As following, an important comparison according to a sector potentially of outlet , where the marketing of the wood over the positioning of the WDE MASPELL

Positioning scheme.3 Turnover per capita –Italian companies, commercialization sector of wood vs WDE Maspell in 2009/2011

Legend:

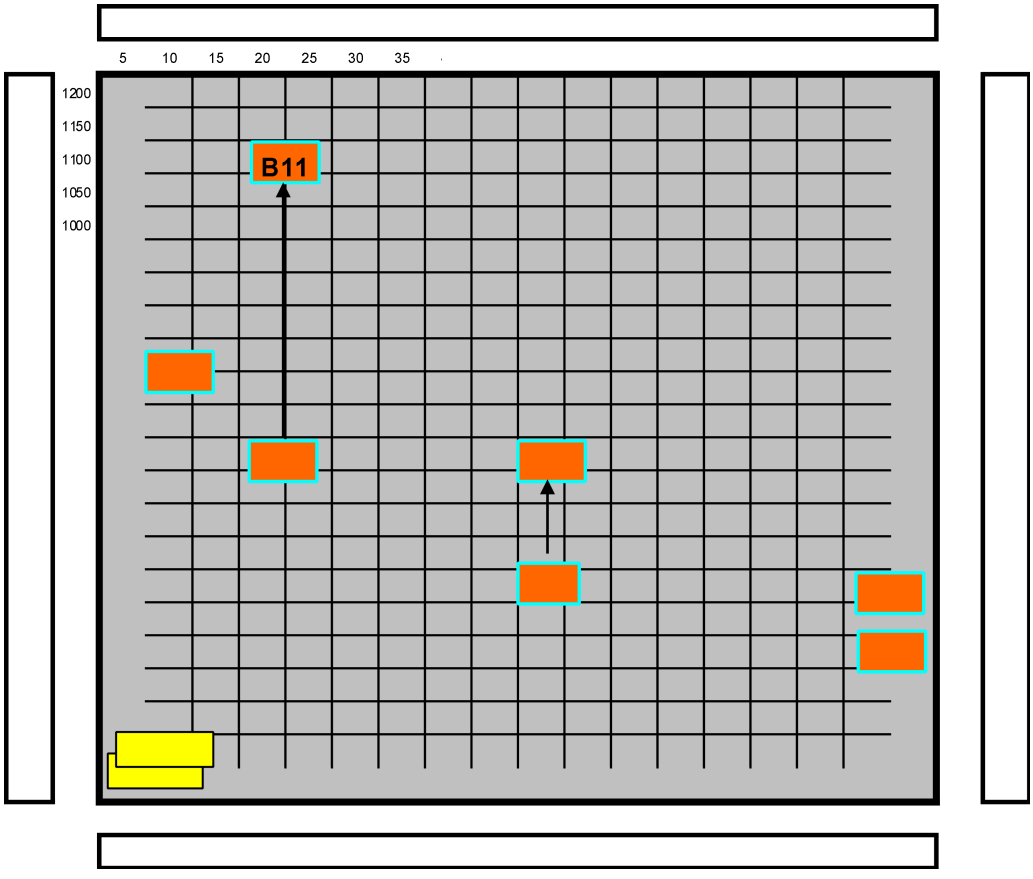
Orange cells **A .. B .. C** etc. = average of turnover per capita pe dimentional starting class

Class A = from 1 to 12 employed

Class B = from 13 to 25 employed

Class C = from 26 to 75 employed

Class D = beyond



Two evident considerations:

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The turnover per capita of any starting class of wood trading companies is higher than the one of similar companies that build machine for woodcrafting.

While in general the companies in the sector manufacturers from 2009 to 2011 have not substantially changed the average revenue per capita, those trade have made considerable efficiency significantly improving the performances . The reasons for this may be the most different:

- The efficiency of internal processes
- Internationalization of markets
- Selling prices
- Quantities sold
- Vertical integration

1)

	Nu Ad		
Classe di addetti A	da 1		
Classe di addetti B	da 1		
Classe di addetti C	da 2		
Classe di addetti D	c		
WDE MASPELL			

2) The profitability of companies in the trade is better than that of the construction machinery sector . Moreover , even in a period of crisis in the market , as the 2009-2014 trade enterprises have the capacity to undertake enforcement actions much more effective that generated a significant return on investment .

	Nu Ad		
Classe di addetti A	da 1		
Classe di addetti B	da 1		
Classe di addetti C	da 2		
Classe di addetti D	c		
WDE MASPELL			

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A comparison (although not perfectly homogeneous for the period under observation and for segments) shows that between the major performers as part of the modified wood, WDE , Merchants Italian wood and Italian manufacturers of machines for machining . Accoya, thermowood and Kebony are proprietary technology (similar to WDE) but their core business is the marketing of treated wood and NOT selling treatment plants .

ACCOYA (201			
KEBONY (201			
THERMOWOOD (201			
Media costruttori macchine IT (201			
Media commercianti legno IT (201			

Therefore, there is a substantial difference in profitability between segments within the value chain of the wood: the producer of technology for the treatment and / or woodworking the timber merchant, the contribution margin and ROE grow significantly and seem less subject to market fluctuations

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3.1.6 SWOT ANALYSIS

STRENGHTS	WEAKNESSES
Technology TV4NEWOOD • Process 100 % ecological • Probably the most economical process for the production of thermally modified wood • Wide range of wood species treated **Thermo Modified Wood Product** • No odor • Use indoors without problems • High durability • Excellent dimensional stability • Resistant to atmospheric and biological agents without any further treatment (impregnation or painting) • Treatment completely homogeneous • Non-toxic, sustainable , 100 % recyclable **Communities** • Today seven companies employ plants TV4NEWOOD for different essences and different purposes. Fast knowledge transfer	• lack of a brand of patented technology • lack of brand and brand product • lack of a distribution network and a structure marketing • presence in the market of similar products (wood heat treated or otherwise modified) that have the same responsiveness of use

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OPPORTUNITIES	THREATS
• entry into the market of commercialization of wood and semi-finished engineered • creation of a consortium of producers of wood thermo vacuum treated • export growth in the newly industrialized countries ; • R & D of new products engineered ; • growth of business size through acquisitions and mergers ; • Investments in new technologies to achieve greater production flexibility ; • Common communication strategy for preservation of furniture products	• increase the bargaining power of the distribution of the wood = lower margins on sales of facilities ; • Increased competition, entrance of new technologies for modifying the wood (impregnation) • low barriers to entry , especially in non-European countries (China , Asia)

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