

# Wood modification in France

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## Introduction

As a result of increasingly stringent constraints, biocidal restrictions and costly investments, the European regulations has imposed a reduced flexibility for wood preservative manufacturers. It is therefore necessary today to diversify the types of wood modification processes. The concept of modified wood in France has attracted considerable interest over the last years both with industry and academia, with activities in several modification methods, Table 14.

French activities in thermal modified timber (TMT) were studied since the 80s, and were mainly conducted in collaboration between universities and industries. Improvements of existing processes and material studies were focused in this research. The thermal modification is now well established in France with about 13 companies, working on various processes (reticulation<sup>®</sup>, WTT<sup>®</sup>, ThermoWood<sup>®</sup>, Thermostabilisation and Inductive heating), representing an annual production of heat modified woods around 35,000 m<sup>3</sup>/year. Actually, the studies are mainly focused on (i) the quality control of the produced thermal modified wood materials (Candelier *et al.* 2016) and on (ii) the combination between thermal modification and biocide agents (Salman *et al.* 2017).

Alongside thermal and chemical wood modification, there has been an interest in hydrophobation of wood. Academic and industrial companies from France, Switzerland and Austria just finished an EU WoodWisdom-Net project (BioCoPol – Enhancing wood durability and physical properties through innovative bio-based sustainable treatments), showing the potential of some of their formulations.

Acylation of wood has been extensively studied using a wide range of chemicals, among them, acid anhydride, acyl chloride, ketene or even carboxylic acid. Even if no acetylated wood producer is present in France, the commercialization of Accoya<sup>®</sup> wood products in France has increased by 20% in 2017-2018.

Mixed acetic-fatty esters preservatives have been also recently developed by Lapeyre<sup>®</sup> industry and INP Toulouse. This method permits the grafting of acyl groups on wood leading to dimensionally stable treated wood bearing acetyl and fatty acid acyl chains, showing improved water repellence, which was recently unsuccessfully marketed by Lapeyre under the trade name of Wood Protect<sup>®</sup>.

INRA, INPT and ENSIACET academic institutions worked on wood preservatives from ASMA (Anhydride succinite of methyl alkenoate), through a European project called SURFASAM. ASMA provides wood material with a Use-Class 3, and this product is now the subject of requests from industrials (Final report SURFASAM).

In addition to the protection to fungal and insects degradations, manufacturers are now developing more flame retardant solutions. Piveteau Bois<sup>®</sup> company developed Igni-B, in collaboration with Arch Protection<sup>®</sup>, consisting in a resin impregnation, in addition to active substances, in order to definitively fix them in the wood following the resin polymerization.

Finally, WoodHa<sup>®</sup> company had obtained a durability certificate with the preservative system BIME<sup>®</sup>1, combining flame retardant and non-film forming saturator in aqueous phase.

**Table 14:** Wood modification technologies, producers, companies and production volumes in France

<b>Wood modification technology</b>	<b>Producer, process short description and website</b>	<b>Annual volumes n.a. = not available</b>
Thermal modification	BOIS DURABLE DE BOURGOGNE® -. Part of the ThermoWood® Association., Jartek® <a href="http://www.boisdurablesdebourgogne.fr">www.boisdurablesdebourgogne.fr</a>	3,000 m <sup>3</sup> /year, mainly used for siding, cladding, decking, joinery and furnitures
Thermal modification	HIGH TECH WOODS	n.a.
Thermal modification	ECOLWOOD - ThermoVacuum process, Maspell®	1,500 m <sup>3</sup> /year mainly used for cladding and decking
WTT process	THERMO COLOR BOIS, WTT Process <a href="http://www.thermo-color-bois.fr">www.thermo-color-bois.fr</a>	1,500 m <sup>3</sup> /year, mainly used for siding, decking, parquet, garden furniture, pool surrounds and exterior joinery.
Thermal modification	BOIS DURABLE CENTRE FRANCE, ThermoVuelto® process <a href="http://www.parquet-chene-massif.com">www.parquet-chene-massif.com</a>	n.a.
Thermal modification	DUMOULIN, BESSON® process, Commercializatiuon under Lunawood® trend ( <a href="http://www.lunawood.fi">www.lunawood.fi</a> ) <a href="http://www.dumoulin-bois.fr">www.dumoulin-bois.fr</a>	8,000 m <sup>3</sup> /year, mainly used for Cladding, flooring and plywood
ThermoWood	Silvalbp <a href="http://www.sivalbp.fr/">http://www.sivalbp.fr/</a>	8,000 m <sup>3</sup> /year
ThermoWood	DUCERF Group <a href="https://en.ducerf.com/">https://en.ducerf.com/</a>	n.a., A JARTEK thermally modification, mainly hardwood timber
Retification	SEFWOOD, Bois réifié® process <a href="http://www.sefwood.com">www.sefwood.com</a>	n.a., mainly used for siding, decking, exterior furniure.
Thermostabilisation	SYLVABP, Baschild® process, Commercialization under Ecothermo® trend <a href="http://www.sivalbp.com">www.sivalbp.com</a>	8,000 m <sup>3</sup> mainly used for cladding and decking
Thermal modification	BMT PRODUCTION, BESSON® process <a href="http://www.bois-thermo.com/">www.bois-thermo.com/</a>	n.a., mainly used for siding, decking, parquet, exterior furniture.
Thermal modification	LIGNIVALYS, Stillwood® process perfomed with a Maspell® vacuum oven <a href="http://www.lignivalys.fr">www.lignivalys.fr</a>	n.a., mainly used for siding, decking, exterior furniture.
Inductive heating	Laglasse <a href="http://www.laglasse.net/">www.laglasse.net/</a>	n.a., used for coopers in wine industry
Retification	RETIWOOD, N.C	n.a.
Thermal modification	KIT FORET, N.C <a href="http://www.kit-foret.fr">www.kit-foret.fr</a>	4,000 m <sup>3</sup> /year, mainly used for siding, decking, exterior furniture.
Anhydrides mixtes traetement	LAPEYRE – Woodprotect®, Vacuum/pressure impregnation + heating 140°C-2H Developped in coopération with INP Toulouse Patent WO 03 084 723 [58]	n.a., mainly used for exterior joinery in pine wood
Fire retardant	PIVETEAU BOIS / ARCH PROTECTION, Igni-B Resin impregnation <a href="http://www.piveteaubois.com">http://www.piveteaubois.com</a>	n.a., mainly used for siding and wood building material.
Fire retardant	WOODHA®, BIME®1, flame retardant and non-film forming saturator in aqueous phase <a href="http://www.woodenha.com">http://www.woodenha.com</a>	n.a., mainly used for siding and wood building material.

# Modification technologies and production volumes

There are a range of evolving modification processes being commercialized within France, and due to the relative newness to the market are still in the expansion phase. Table 13 gives a brief overview of these modification methods. In addition, France has a high demand for quality products, meaning that there is a strong import demand for modified wood.

Timber from different commercialised modification processes are mainly harvested in French and closed European forests, but they are also imported directly into France for use. The main wood species transformed by this different processes are mainly: pine, Douglas fir, beech, ash, poplar, etc. (Gérardin 2016).

## Practical examples

Figure 23 show some examples of the uses of modified wood in France.



**Figure 23:** The use of modified wood in France: siding of thermally modified poplar wood by Bois Durable de Bourgogne® company (left), thermal-modification kiln, Jartek®, 20 m<sup>3</sup>, Bois Durable de Bourgogne® (middle), and WoodenHa® process, fire-retardant impregnation in an autoclave (right).

## References

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