

# THERMO-TREATMENT TECHNOLOGIES WORLDWIDE

All the thermo-treatment processes have in common the treatment of sawn wood at elevated temperatures in the range between 160 °C and 260 °C (320 – 450 °F) in oxygen-free environment. The main differences between the processes are to be seen in the process conditions (process steps, steam or nitrogen, wet or dry process, use of oils, steering schedules etc.) and published in several patents. Westwood is the latest technology of new generation introducing the 3-D heat control, which is important to treat hardwoods.

**Plato-Process (PLATO BV, The Netherlands)** uses different a hydrothermolysis step with a dry curing step. In the first step of the process, green or air dried wood, is treated at temperatures typically between 160 °C - 190 °C under increased pressure (superatmospheric pressure). The process time is depending on the wood species used, the thickness, shape of wood etc. , and uses a thermolysis step (4-5 hours ) followed by an intermediate drying step (3-5 days) and a final curing step (14-16 hours). In some cases, a conditioning step (2-3 days) is needed.

**Retification Process (NOW New Option Wood, France)** starts with relatively dry wood (approx. 12 %) and heats up the material up to 200 °C – 240 °C in a nitrogen atmosphere (below 2 % oxygen).

**Bois Perdure (BCI-MBS, France and Canada)** process starts with fresh wood, subsequently a fast drying process and heating up to 200°C – 240°C under steam atmosphere. The first step of the process consists in an artificial drying in the oven. Then the wood is heated under steam atmosphere (steam generated from the water of the wood).

**OHT – Process (oil-heat treatment, Menz Holz, Germany)** is performed in a closed process vessel. After loading the process vessel with wood, hot oil is pumped from the stock vessel into the process vessel where the hot oil is kept at high temperatures circulating around the wood. Before unloading the process vessel the hot oil is pumped back into the stock vessel. For different degrees of upgrading, different temperatures are used.

**Thermo Wood process (Stora, Finnforest, Stellac, Jartec, Finland)** has been developed at the Finnish Research Center VTT together with the Finnish industry. Today the process is licensed to the members of the Finnish ThermoWood Association. The ThermoWood process can divided into three main phases: – Phase 1. The kiln temperature is raised at a rapid speed using heat and steam to a level of around 100°C. – Phase 2. Once the high temperature kiln drying has taken place the temperature inside the kiln is increased to a level between 185°C and 230°C. – Phase 3. The final stage is to lower the temperature down using water spray systems and then once the temperature has reached 80-90°C remoisturising and conditioning takes place to bring the wood moisture content to a useable level over 4%.

**Westwood (USA)** developed the technological achievements of similar processes in the world. The new Westwood System automatically adjust to the specie, size, initial moisture content, chemical composition and geometry of the original timber, which allow to get a predictable result, which is especially important to treat hardwoods. In 2007 the heat wave control has been improved to 3-D Technology, compared with 1-D linear models of the other European technologies, developed on the principles of convection dry kilns. Westwood process takes 12-16 hours, has the best cost efficiency and the best equipment price in the market.

The resent thermo-treatment research in Europe shows that just heating wood to 200° C (400° F) in an oxygen-free environment is not thermo-treatment. The experiments performed in Europe (2005-2008) shows that the properties of stability and durability of thermo-treated wood depend on more complicate reactions than just heating and require the control of both temperature and time of process, which we successfully implemented in Westwood technology.



Retification (France)



Hot oil method (Germany)



Finland method (ThermoWood)



Westwood process (USA)

### Westwood technology advantages and applied innovations.

- ✓ As mentioned above, Westwood technology allows us to process hardwood predictably (which differ from softwoods, in that hardwood exhibit complicated thermochemical reactions at heat treatment temperatures). This reaction management is one of the Westwood achievements (alternative technologies basically work with softwood where the process control is based on environmental temperature, which is unacceptable for hardwoods).
- ✓ Due to the feedback control system, allowing the processes to be managed, Westwood technology allows us to treat the different species of wood. The size of chamber and short cycle time provides essential flexibility for smaller orders.
- ✓ The Westwood chambers sizes are ideally balanced between reasonable heating and treatment times based on the wood species. As a result, the Westwood heat treatment cycle takes only 12-16 hours. Productivity of Westwood chambers (5,500 bf of one full loading) corresponds to the productivity of other manufacturer chambers with 50,000 bf of one full loading. By the intellectual Westwood cycle processing the cost of Westwood treatment appears less (in 3 times), than in the larger chambers, compelled to use liquid fuel or natural gas energy. Westwood chambers have only 0,35 MWatt consumption while similar chambers of other manufacturers have 1 MWatt consumption.
- ✓ Westwood technology uses only electric heaters for heat exchanging processes management and the air, as the heater environment. Similar technologies use steam or hot oil as heat-carriers that leads to loss of accuracy of processes management (accuracy of Westwood processes is only 0.3 degree, that is much more than the gas or fuel fired chambers). Besides, using oil or steam under pressure demands special pipelines, that essentially raises safety concerns.
- ✓ As a result, the Westwood energy consumption thanks to good insulation and compact size of the chambers is significantly less than the European thermo-treatment processes. Even the combined mode drying + thermo-treatment consumes less energy than conventional dry kilns.
- ✓ The Westwood technology is managed by electronics, and the human intervention factor is completely eliminated. The chamber turns off as soon as the cycle is completed and also has the multilevel system of protection against failures and the intellectual system of self-diagnostics, so it does not require the operator on duty around (which saves costs significantly). In case of emergency situations or malfunctions, such as interruption of water supply or failure of any sensor, the system will cool down the chamber to a safe temperature automatically (cycle can continue from this point after removing the causes of failure if necessary). The system takes readings from more than 20 various gauges every 5 seconds during a cycle, and makes a decision on conducting a cycle which allows for predicted results, even for such difficult species for treatment as, for example, ash or oak.
- ✓ Westwood system has the options of Internet processes remote management (even by the cell phone) that allows to manage the process through Internet (if necessary) and the manufacturer to take diagnostics of equipment, update programs or to correct malfunctions remotely.
- ✓ The 3-D control not only allows getting a predictable result for hardwood treatment (which includes the ability to choose colors that are more suitable for a specific product), but also to produce specific products, such as boards with color deviation, colored parquet (see photo) and other design products.
- ✓ Westwood equipment is delivered as a ready-to-use unit (plug-and-play) and can be installed within a few days (unlike the European chambers where the installation and start up takes approximately one year). All you need to start the equipment operating is to supply the water and the electricity. The equipment is built in to a standard hi-cube 40' marine container; therefore it is easy to transport and install.
- ✓ A set of interchangeable parts and components required for the first 2 years of work is delivered together with the Westwood equipment with no additional cost. So, the first 2 years of operation of Westwood equipment does not require any additional costs.
- ✓ Air emissions and water discharge are having the concentration regulation and comply with all the environmental standards.
- ✓ Through the innovation and design optimization, the cost of Westwood equipment is significantly below the cost of analogues with similar manufacturing capacity. Westwood intellectual cycle system and 3-D heat wave control Technology® are not having the analogous in the world.