Methods for the Manufacture of TMT

Fact Sheet TMT.06

Procedural Principle

The basic common principle of thermal modification is an impact of increased temperatures of between 160 °C and 250 °C (usually 180...230 °C) in low-oxygen conditions and can be termed as mild pyrolysis (Wienhaus 1999). The methodical types particularly differentiate in their way by which these conditions (an "inert atmosphere") are generated. As yet, the most common practice is thermal modification in an atmosphere of water vapour and wood gas at normal pressure. An overview of currently applied methods is provided by Table 1.
Further differences, apart from the type of oxygen reduction, are to be seen in moisture and pressure conditions and the course of time. These as well as the size and loading of chambers result in varying investment and operational costs. The technical details are proprietary to the plant manufacturers and operators and therefore not generally known. Since its industrial introduction at the end of the 1990s, the methods and plants of continually been improved. The methods are generally suitable for all species of wood.

*Table 1: Types of TMT methods and selected plant manufacturers**

	Special process Conditions	Plant manufacturers*
a	Wood gases + vapour + normal pressure	www.tekmaheat.com (www.jartek.fi); www.mahild.de; www.stellac.fi; www.valutec.fi
b	Wood gases + vapour + increased pressure	www.wtt.dk; www.moldrupsystems.com
c	Wood gases + normal pressure	www.muehlboeck.com
d	Vacuum (+ wood gases)	www.opel-therm.de
e	As a) + an additional high-temperature stage	www.platowood.nl (TMT-Hersteller)
f	Wood gases + nitrogen atmosphere	www.balz-maschinen.ch; Sci Fours et Bruleurs Rey
g	Vegetable-oil immersed	www.scholz-maschinenbau.de

**) no claim to being complete*

Evaluation of Methods

Investigations into the various TMT-manufacturing methods (inter alia Welzbacher and Rapp 2002, Scheiding et al. 2005) none proved to be superior over others regarding modification effects. A systematic comparison of the various TMT methods is currently impossible since reliable data with view of economic parameters and of the environmental balance is not (yet) available.
Previous results have shown that the durability achieved against wood-decaying fungi largely depends on the temperature level during the high-temperature stage. This is more decisive than its duration so that the reduction of the temperature level can hardly be compensated by a longer high-temperature stage. Contrary to that, the (negative) impact of treatment on the strength properties is apparently more dependent on the kind of atmosphere or of the oxygen content, respectively.
However, a decisive criterion for the quality and yield is the quality of the assortment of the input material.
The frequently asked question for the "best" TMT method can be answered as follows:

- The types of methods mainly differ in their way of oxygen reduction ("inert atmosphere"), moisture and pressure conditions and course of time. These as well as the size and loading of chambers result in varying investment and operational costs.
- Regardless of the type of method, certain thermal work needs to be applied in order to obtain the desired effects.
- All types of methods yield similar basic effects (increased biological durability, reduction in swelling/shrinkage, equilibrium moisture and strength).
- However, TMT-treated products differentiate in their specific characteristics profiles.
- The methods cannot objectively be differentiated into "good" or "bad" ones.

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