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► **To cite this version:**

Julien Froidevaux, Thomas Volkmer, Joseph Gril, Marco Fioravanti, Parviz Navi. Comparison between accelerated thermo-hydro aged wood and naturally aged wood. 1st Workshop of COST Action FP0904 'Mechano-Chemical transformations of wood during Thermo-Hydro-Mechanical processing', Feb 2011, Bienne, Switzerland. hal-00796686

HAL Id: hal-00796686

<https://hal.science/hal-00796686>

Submitted on 4 Mar 2013

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Comparison between accelerated thermo-hydro aged wood and naturally aged wood.

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Key words: accelerated aging, micro-mechanics, thermo-hydro treatments.

Abstract

The effects of aging in wood in term of physical, mechanical and chemical degradation has been studied first by Jiro Kohara [1] and more recently by Erhardt et al. [2-3] and Obataya [4]. It has been observed that similar degradation can be found in thermo-hydro (TH) treated wood [4]. The aim of this study is to compare the mechanical behavior of naturally aged and accelerate TH wood in the radial direction.

A first pressure vessel with controllable temperature, oxygen pressure and relative humidity has been designed and constructed. The temperature and relative humidity range are 100 to 150 °C and 2 to 100% of RH respectively. This pressure vessel is able to maintain the conditions constant for long term processing. A second pressure vessel, using a vapor heating system, has been used to test higher temperature range (120 to 200 °C). The amount of oxygen cannot be set in this last thermal cell. Different types of thermo-hydro treated wood have been done with these machines.

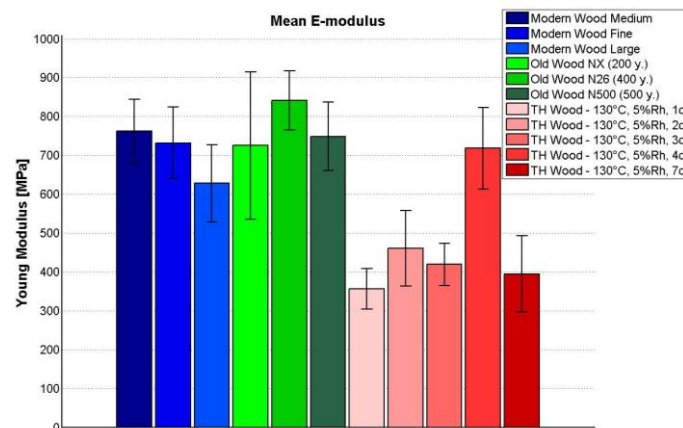


Figure 1: Mean radial Young's modulus of sound, old and accelerated TH aged wood measured at 23°C and 76 % RH.

COST Action FP0904 „Thermo-Hydro-Mechanical Wood Behaviour and Processing“
 February 16-18, 2011 / Biel (Bienne), Switzerland

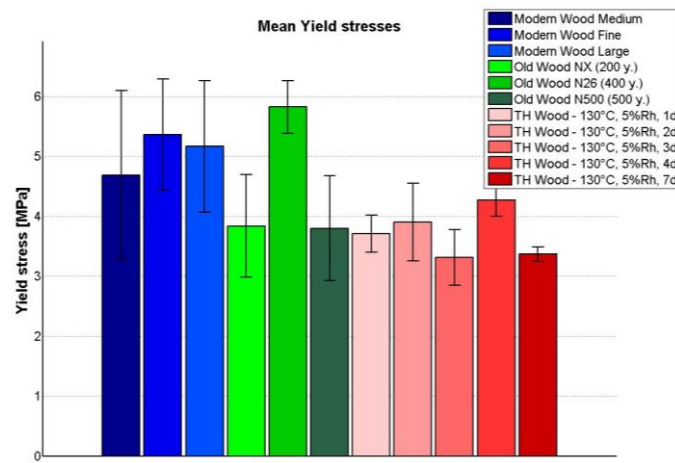


Figure 2: Mean radial yield stresses of sound, old and accelerated TH aged wood measured at 23°C and 76 % RH.

Preliminary results indicate that in general the radial Young's modulus of natural aged wood does not modify extremely, as it can be seen in figure 1. However, the yield stress shows a decrease of about 25% (figure 2). Similar decrease of the yield stress has been shown on treated wood at 130°C, 5% of RH and under vacuum pressure for different time from 1 to 7 days. The coloration of the treated woods seems also to be similar to the naturally aged wood. However, the thermally treated woods show an important decrease of the radial Young's modulus.

Some micrographs have been prepared in the tr plane. It has been seen some localized damages in the structure of old and accelerated TH wood which could reduce the fracture properties. Such damages have not been seen in such quantity in the sound woods.

Acknowledgement: The financial support of the Swiss National Science Foundation (FNS) under the project K-21K1-122336/1 is acknowledged with gratitude.

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