Preface

Book of abstracts includes the scientific program and the abstracts of papers will be presented at the Final COST Action FP0904 Conference on "**Recent Advances in the Field of TH and THM Wood Treatment**" at the **Luleå University of Technology**, Division of Wood Science and Engineering, in Skellefteå, Sweden on 19–21 May 2014.

The main objective of COST Action FP0904 is to achieve a better understanding on mechanical and chemical transformations of wood during Thermo-Hydrous (TH)/ Thermo-Hydro-Mechanical (THM) processing through collaborations between different researchers from the wood and material sciences. This Action provides cooperation and encourages research between research groups from academia and industry to help to overcome the challenges in scaling-up research findings, improving full industrial production, process improvement, in understanding the relations between the processing parameters, material properties and the development of new products. The COST Action FP0904 consists of three Working Groups (WGs):

WG1: Identification of chemical degradation of wood under Thermo- Hydrous treatment
WG2: Modelling of Thermo-Hydro-Mechanical behaviour of wood during processing
WG3: Innovation and new products by Thermo-Hydro-Mechanical processing

We wish the conference provides a forum and an opportunity for experts and young researchers from worldwide academia and industry to present their latest research, exchanging and developing new ideas within the field of TH and THM wood treatment. The objectives of this conference are to present and discuss the state-of–the-art of TH/THM wood treatment in open and closed systems and the challenges in wood characterization and scaling-up from laboratory to full industrial production, through a discussion of the latest research results and new ideas. The key objective of this Final Action FP0904 Conference is to present the main results of the Action, to summarise the scientific progress achieved and to formulate open questions and further challenges. This conference will include an evaluation session with representatives of COST and Action Management Committee members.

Luleå University of Technolgy (LTU), established in 1971, is the northernmost University of Technology in Scandinavia and is known for its education and research within the field Wood Science and Engineering. The research area of Wood Technology, Wood Physics and Wood Products Engineering is since 1982 established in the city of Skellefteå. Northern Sweden is one of the most important areas in Europe when it comes to forestry and the wood industry. The Wood Science and Engineering group at LTU are engaged in a wide range of fields within the entire chain from forest to finished product.

On behalf of the COST Action FP0904 Management Committee I would like to thank everybody that kindly contributed to this meeting: all the authors and specially the keynote speakers; Callum Hill, Eiichi Obataya, Otto Th. Eggert and Kevin Candelier.
I gratefully acknowledge the help of the Scientific Advisory Committee in reviewing the abstracts and preparing the scientific program.
I express my sincere gratitude to Dick Sandberg and Mojgan Vasiri for their works in preparing the "book of abstracts" and also as the local organizer.

Parviz Navi
Chair of COST Action FP0904

Scientific Advisory Committee

Parviz Navi	Bern University of Applied Sciences, Switzerland
Dennis Jones	SP Technical Research Institute of Sweden
George Jeronimidis	Reading University, United Kingdom
Mark Hughes	Aalto University, Finland
Mathieu Petrissans	University Nancy 2, France
Lennart Salmen	Innventia Stockholm, Sweden
Joseph Gril	University Montpellier 2, France
Peer Haller	Technische Universität Dresden, Germany
Dick Sandberg	Luleå University of Technology, Skellefteå, Sweden
Mojgan Vasiri	Luleå University of Technology, Skellefteå, Sweden
Dr Christelle Ganne-Chedeville	Bern University of Applied Sciences, Switzerland

Local Organisation

Dick Sandberg	LTU Skellefteå
Mojgan Vaziri	LTU Skellefteå

Web-page administration

Mojgan Vaziri	LTU Skellefteå
Ted Karlsson	Editor-In-Chief , LTU

Accounting & Adminstration

Fredrik Degerman	Economist, LTU Skellefteå
Eva-Stina Nordlund	Institute's administrator, LTU Skellefteå
Cristoffer Schutze	Project administraror

Registrarion

Mrs Inger Lindbäck	NEX meeting & event

Effect of high temperature treatment on selected properties of beech, hornbeam and turkey oak wood

Róbert Németh, József Ábrahám, Mátyás Báder

University of West Hungary, Simonyi Károly Faculty of Engineering, Wood Sciences and Applied Arts, H-9400, Sopron, Bajcsy-Zs. u. 4.

robert.nemeth@skk.nyme.hu

Key words: thermal modification, shrinkage, equilibrium moisture content

Modification of wood using elevated temperatures is a widely used technique to enhance different properties of wood. The targeted upgrade is usually focusing on colour changes, higher biological durability and dimension stabilization induced by moisture content changes [1, 2].

In this study, three hardwood species were exposed to elevated temperatures in order to achieve dimensional stabilization. Changes in density, equilibrium moisture content were recorded and analysed.

Beech (*Fagus sylvatica*), Turkey oak (*Quercus cerris*) and Hornbeam (*Carpinus betulus*) boards with standing annual rings were dried in heat and vent semi-industrial dryer at max. 60°C. From the boards clear (free from any visible defects or irregularities) laths with dimensions of 300x140x25 mm (LxRxT) were cut and prepared for thermal modification. So called twin samples cut from the same board served as control.

The laths were treated at three different temperatures: 140, 160 and 180°C, and 2 different durations: 24 and 48 hours. It is known from literature that significant chemical changes (degradations) occur over 160 °C. One of the temperatures was set below this limit, while the other one exceeded it.

After the treatments the laths were conditioned at 20°C and 65% RH. Than small specimen for tests were prepared with size of 30x20x20 mm (LxRxT).

The dimensions and the weight of the specimen were measured at normal climate (20/65), in absolute dry condition and after full saturation of water. Data gained from this measurement allowed the calculation of the densities, the equilibrium moisture content and the dimension stabilisation.

In Figures 1-3 the maximal volumetric shrinkage values are depicted for all the three hardwoods. Compared to the control all the applied temperatures caused decrease in shrinking, thus a dimension stabilisation could be achieved. Longer duration (48h) caused (with some xceprions) more severe decrease in the shrinking compared to the shorter (24h) treatments. The hardwood species reacted differently to the elevated temperatures. Hornbeam, having the highest density showed significant dimension stabilisation already at the lowest temperature (140°C), while the other two (beech and turkey oak) needed higher temperatures to reach significant stabilisation values. Might the higher density contributed to faster heat conduction, which caused longer effective treatments times at the high temperature range, which caused more severe degradation in case of Hornbeam wood.

In Figure 4 the equilibrium moisture contents for control and treated Hornbeam wood are shown. EMC-changes are following the trends observed for shrinking values. The last was observed for the other two species too.

The conclusion can be drawn that density has a clear influence on the changes caused by thermal treatment. Higher densities resulted in higher changes. Important observation was made, that already at lower temperatures (at 140°C) some structural changes happen in wood, thus the EMCs are lower.

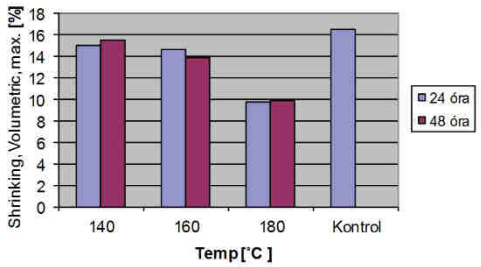

Figure 1. Max volumetric shrinking for Beech. (blue – 24h, purple 48h) density = 766 kg/m^3 (control)

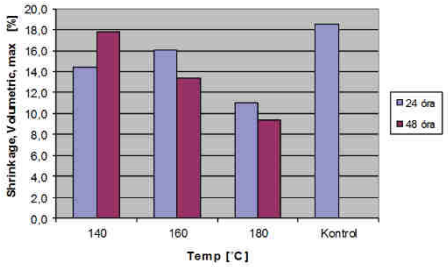

Figure 2. Max volumetric shrinking for Turkey oak. (blue – 24h, purple 48h) density = 720 kg/m^3 (cont.)

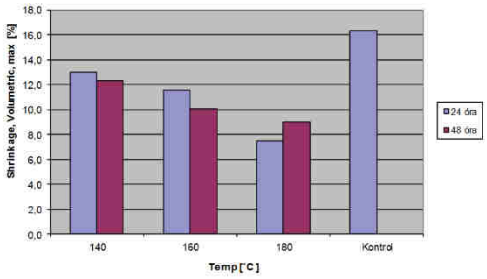

Figure 3. Max volumetric shrinking for Hornbeam. (blue – 24h, purple 48h) density = 860 kg/m^3 (control)

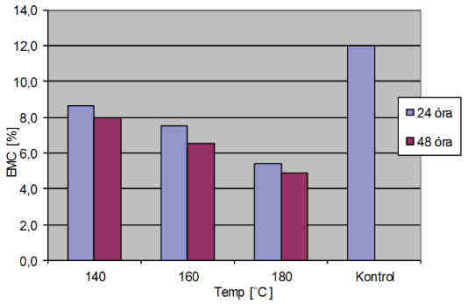

Figure 4. Equilibrium moisture contents for Hornbeam. (blue – 24h, purple 48h)

REFERENCES

1. Esteves, B., Pereira, H., Bioresources, 4(1), 370-404, 2009

2. Sandberg, D., Haller, P., & Navi, P., Wood Material Science & Engineering, 8(1), 64-88, 2013

ACKNOWLEDGEMENT

This study was supported by the Environment conscious energy efficient building TAMOP-4.2.2.A–11/1/KONV-2012-0068 project sponsored by the EU and European Social Foundation.