

# EFFECT OF MODERATE THERMAL TREATMENT ON PROPERTIES OF RESONANCE SPRUCE FOR PIANO SOUNDBOARD

## INTRODUCTION

Thermal modifications of wood could provide perspective way to reduce negative effect of moisture on musical instruments. Resonance spruce (*Picea abies* L. Karst) used for soundboards is characterized by high sound velocity in longitudinal direction, low internal friction and high specific dynamic modulus of elasticity. The moderate thermal treatment with steam protection can maintain original acoustic properties with significant influence on equilibrium moisture content (EMC) and dimension stability.



Figure 1 Laboratory thermal modification chamber

## MATERIAL & METHODS

To test the effect of thermal treatment the 3 groups of specimens (44mm × 450mm × 12mm) of resonance wood selected from piano soundboards manufacturing have been prepared (un-treated, 180°C, 200°C) and conditioned in 20°C and relative humidity steps of 40%, 60% and 80%. Wood specimens were heat treated using laboratory thermal modification chamber (Fig. 1 and Fig. 2) using atmospheric pressure and superheated steam environment.

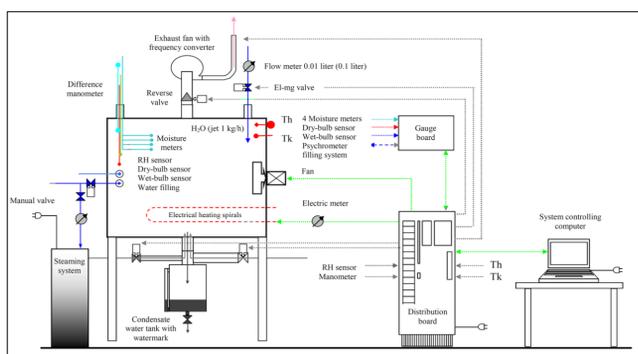


Figure 2 Laboratory thermal modification chamber

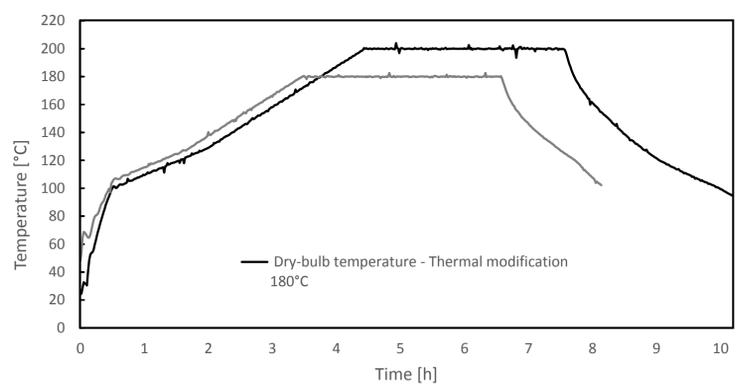


Figure 3 Process schedule for 180°C and 200°C

## RESULTS AND DISCUSSION

The relative weight loss 4.7% and 7% was achieved by modifications at 180°C and 200°C respectively. EMC, longitudinal and bending dynamic modulus of elasticity, logarithmic decrement of damping and acoustic conversion efficiency (ACE) were evaluated in every step of conditioning.

The decreasing of EMC by both thermal treatment is significant (Fig. 4), the specimen modified at 180°C showed about 36% lower EMC at 60% relative humidity, the treatment by 200°C brought about 42% decreasing of EMC. Both treatments significantly affected EMC but the effect on acoustic properties was not statistically significant (Fig. 5), however, the changes for 200°C treated group were more perceptible.

Acoustic properties were compared at every step of conditioning too. Dynamic moduli and ACE decreased with higher EMC and the damping increased for control group and both modified groups.

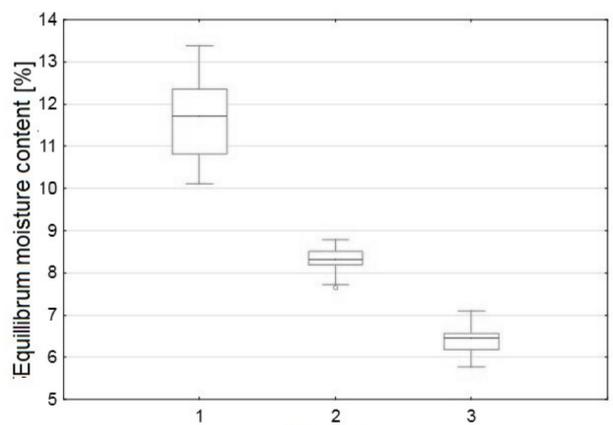
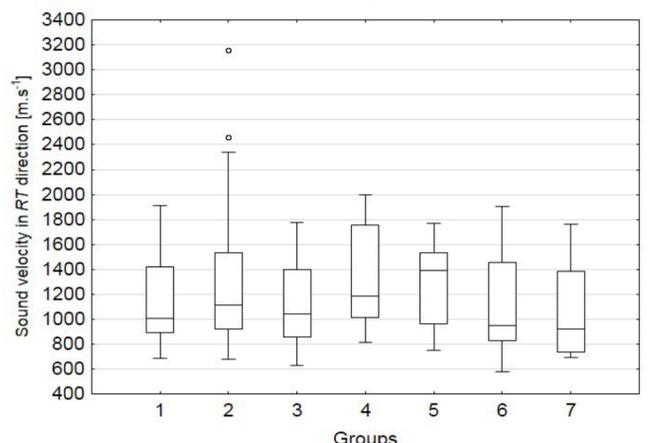
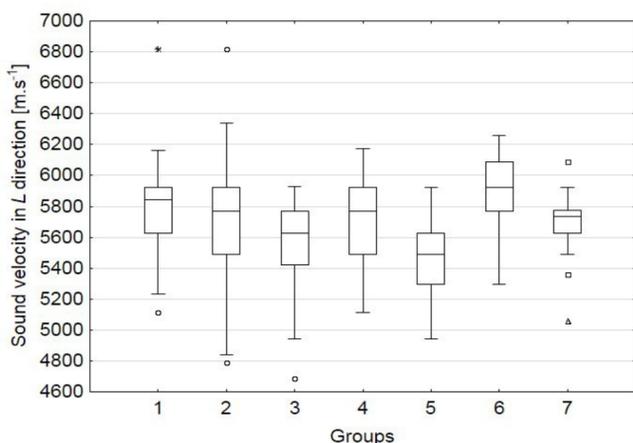


Figure 4 EMC of samples @ 3 levels of treatment



Figure 5 Spruce samples @ 3 levels of treatment



Description of groups: 20 °C 40 % reference (1), 20 °C 60 % reference (2), 20 °C 80 % reference (3), 20 °C 60 % modified at 180 °C (4), 20 °C 80 % modified at 180 °C (5), 20 °C 60 % modified at 200 °C (6), 20 °C 80 % modified at 200 °C (7)

Figure 6 Sound velocity in longitudinal and transversal direction.

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