

Thermal Modification of Birch Using Saturated and Superheated Steam

Oslo October 27 – 28th 2011

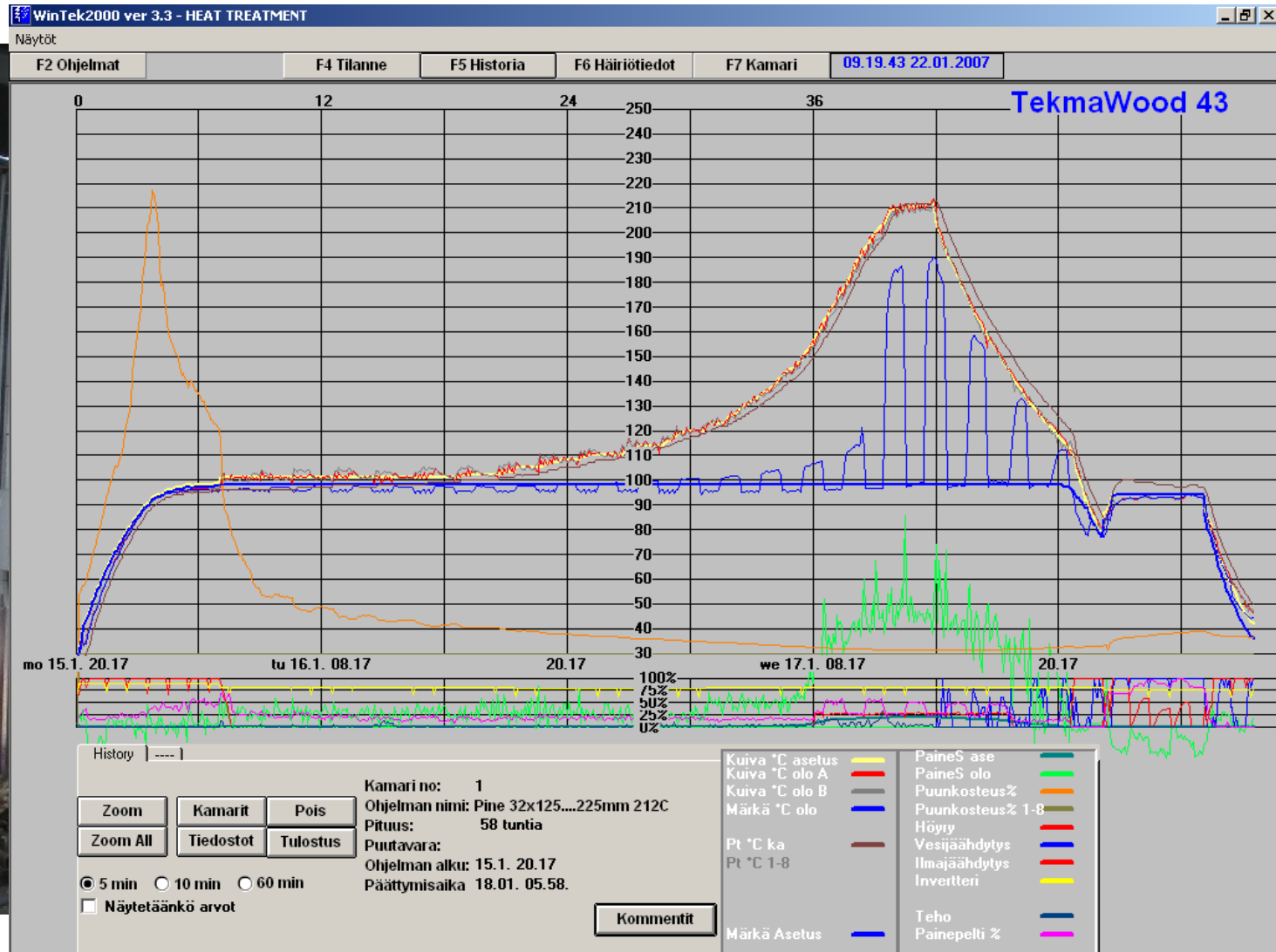
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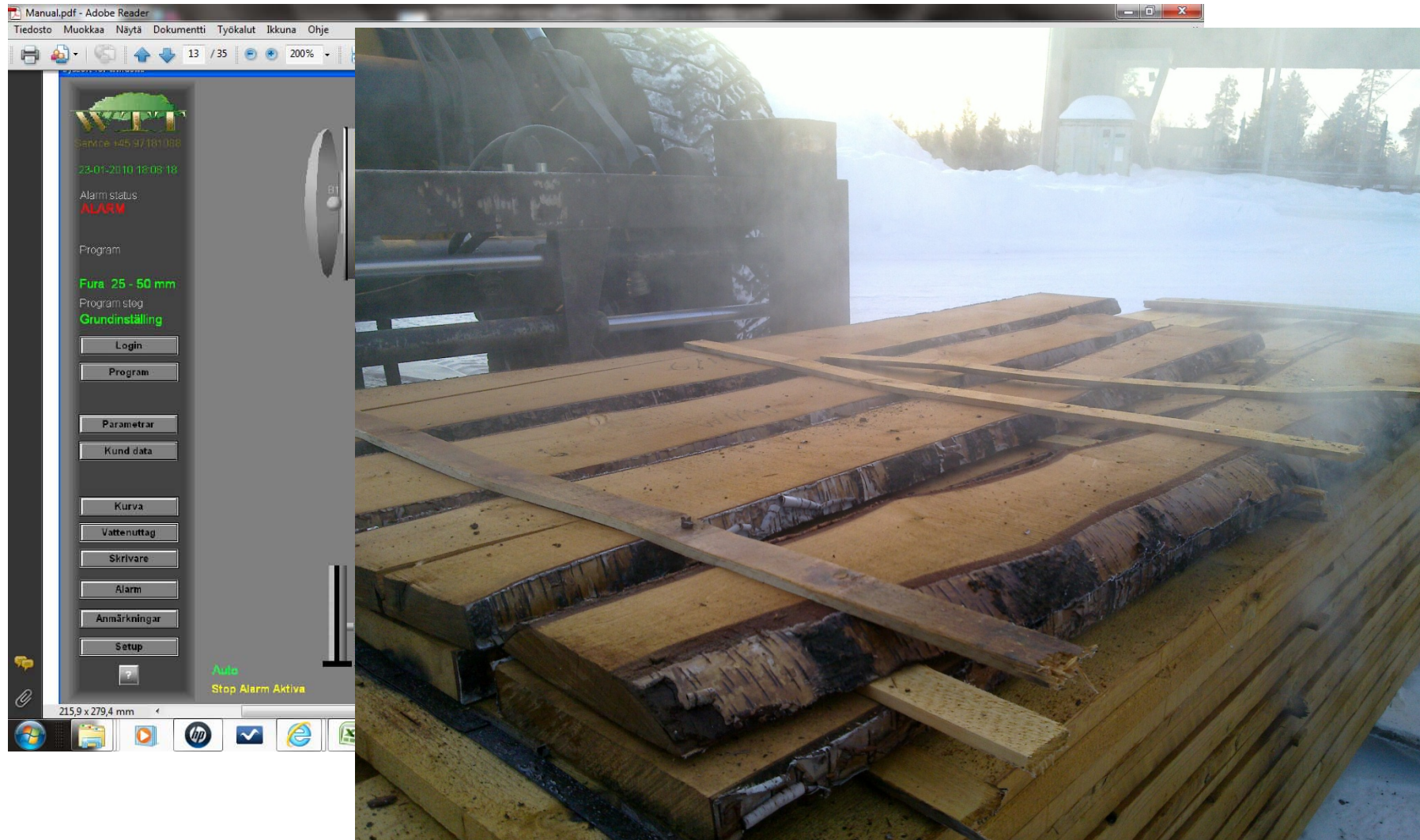
Key words

- ***Superheated steam*** is "dry" steam at a temperature higher than water's boiling point. Superheated steam is used in ThermoWood® process.
- ***Saturated steam is*** steam that is in equilibrium with heated water at the same pressure, i.e. it has not been heated past the boiling point for that pressure. Saturated steam is used in thermal pressure autoclave processes (e.g WTT, Firmolin®)

Superheated steam



Saturated steam



Background data

- Specie: Birch (*Betula pendula*)
- Source: Eastern Finland, NNE
- Number of samples: 22 in each group
 - untreated reference
 - superheated 185°C
 - saturated steam 160°C
- Treatment plants:
 - Mikkeli, Finland (superheated steam)
 - Arvidsjaur, Sweden (saturated steam)

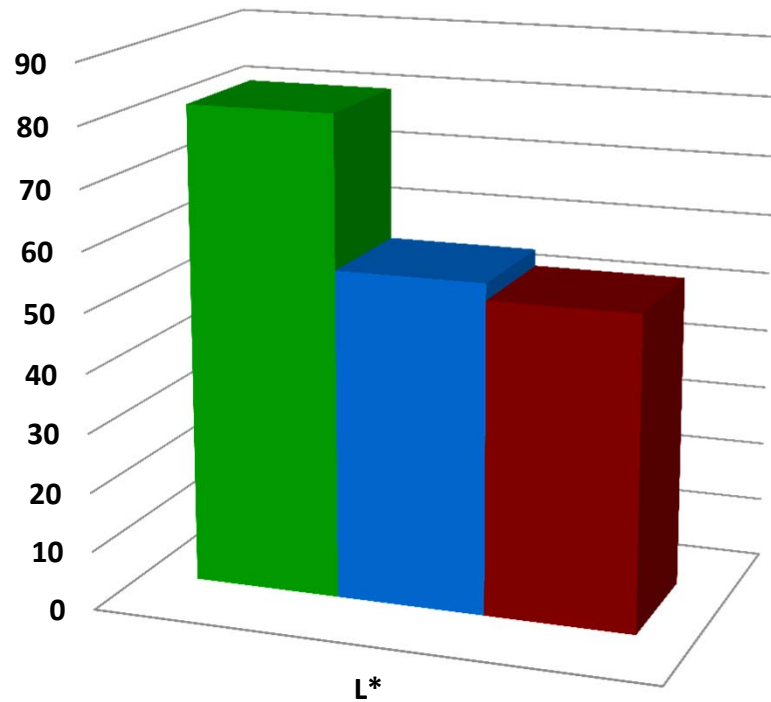
Tests

- *Colour*
- *Equilibrium moisture content (EMC)*
- *Dimensional stability*
- *Acidity*
- *Brinell hardness*

Results

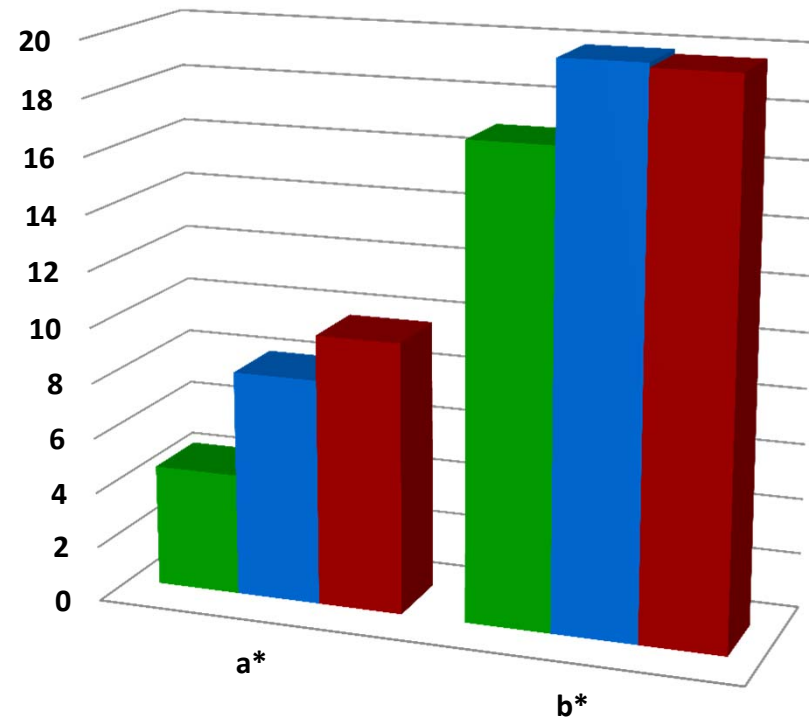
Colour L*a*b*

L* (lightness)



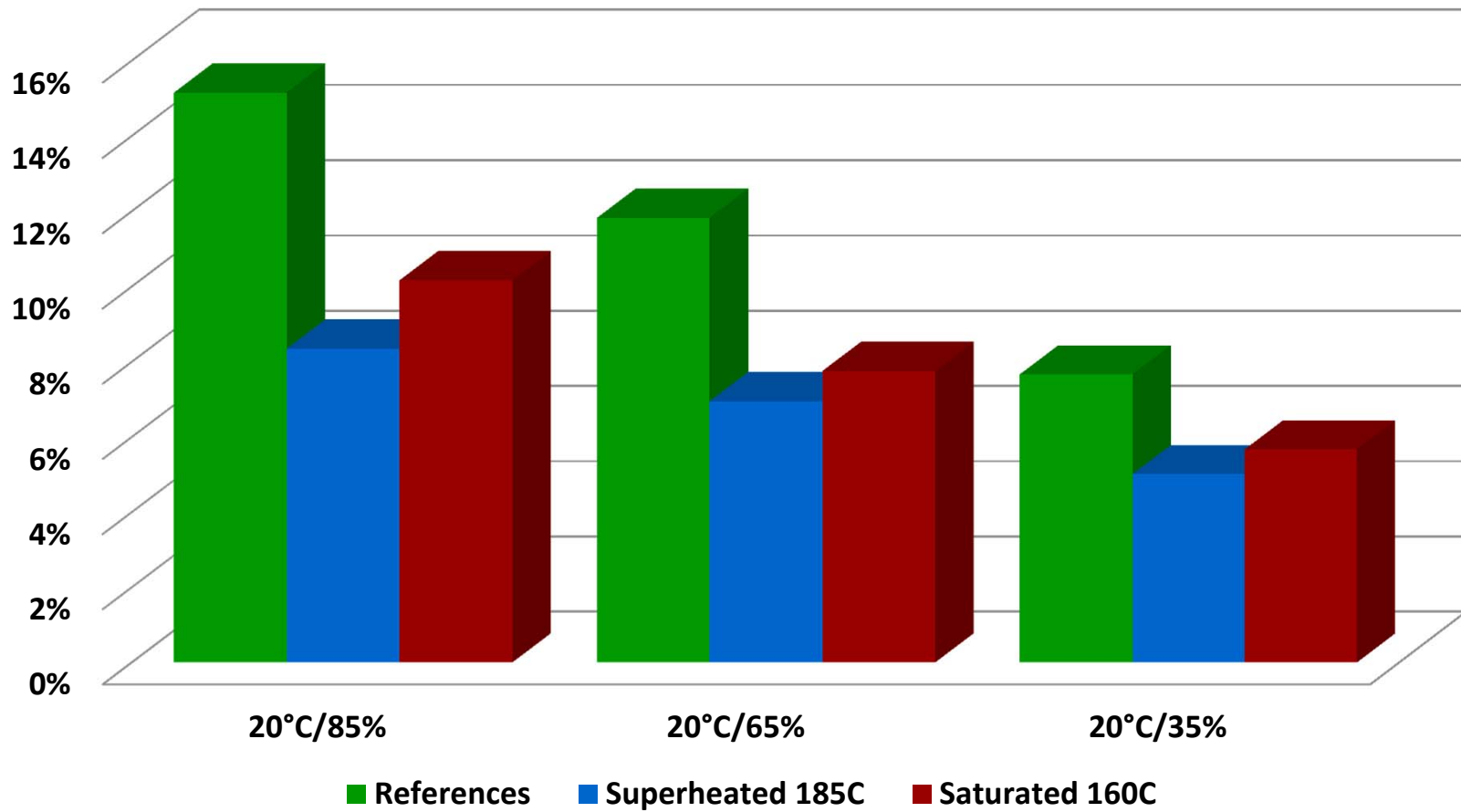
■ References ■ Superheated 185°C ■ Saturated 160°C

a* and b* ("redness and yellowness")

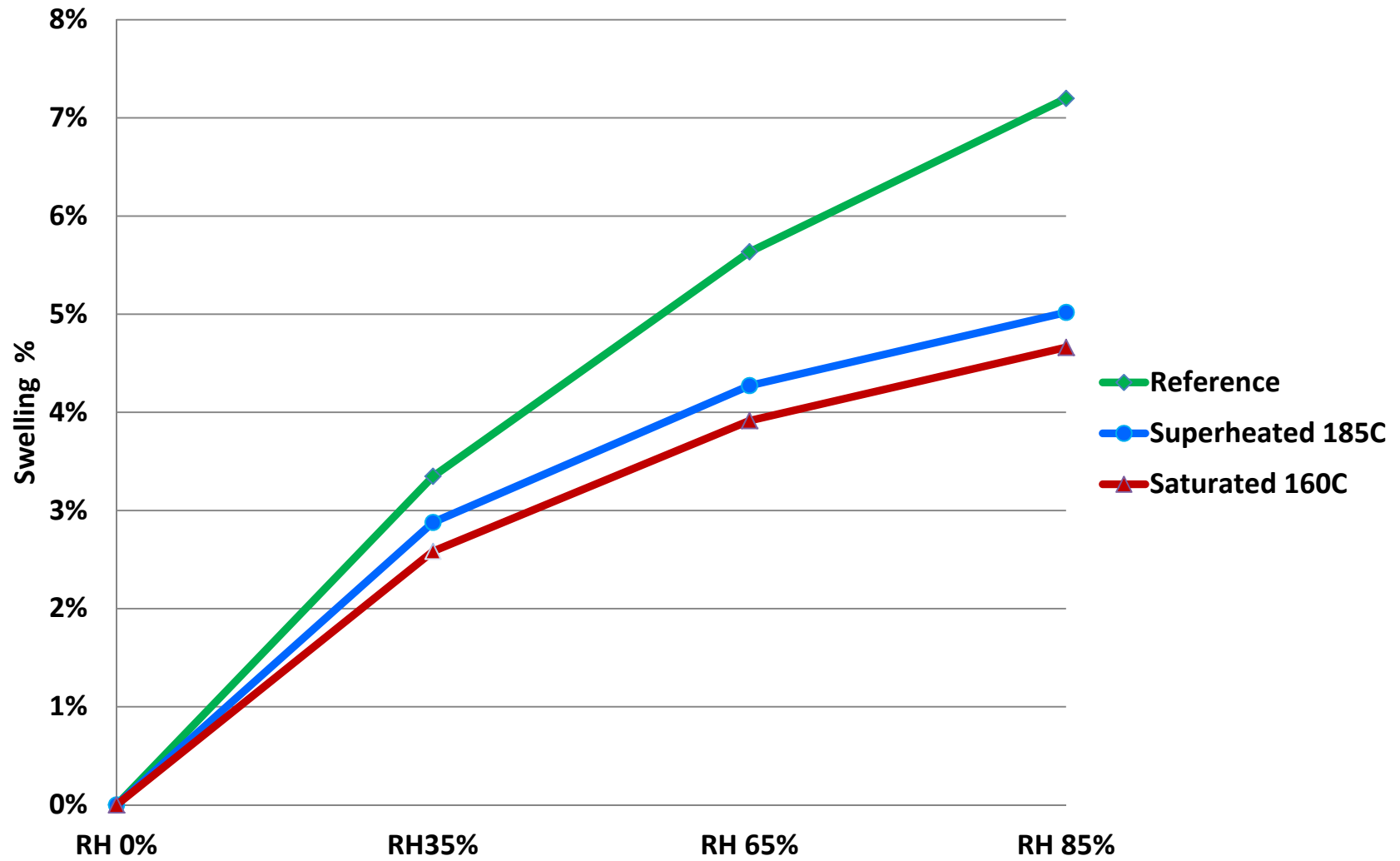


■ References ■ Superheated 185°C ■ Saturated 160°C

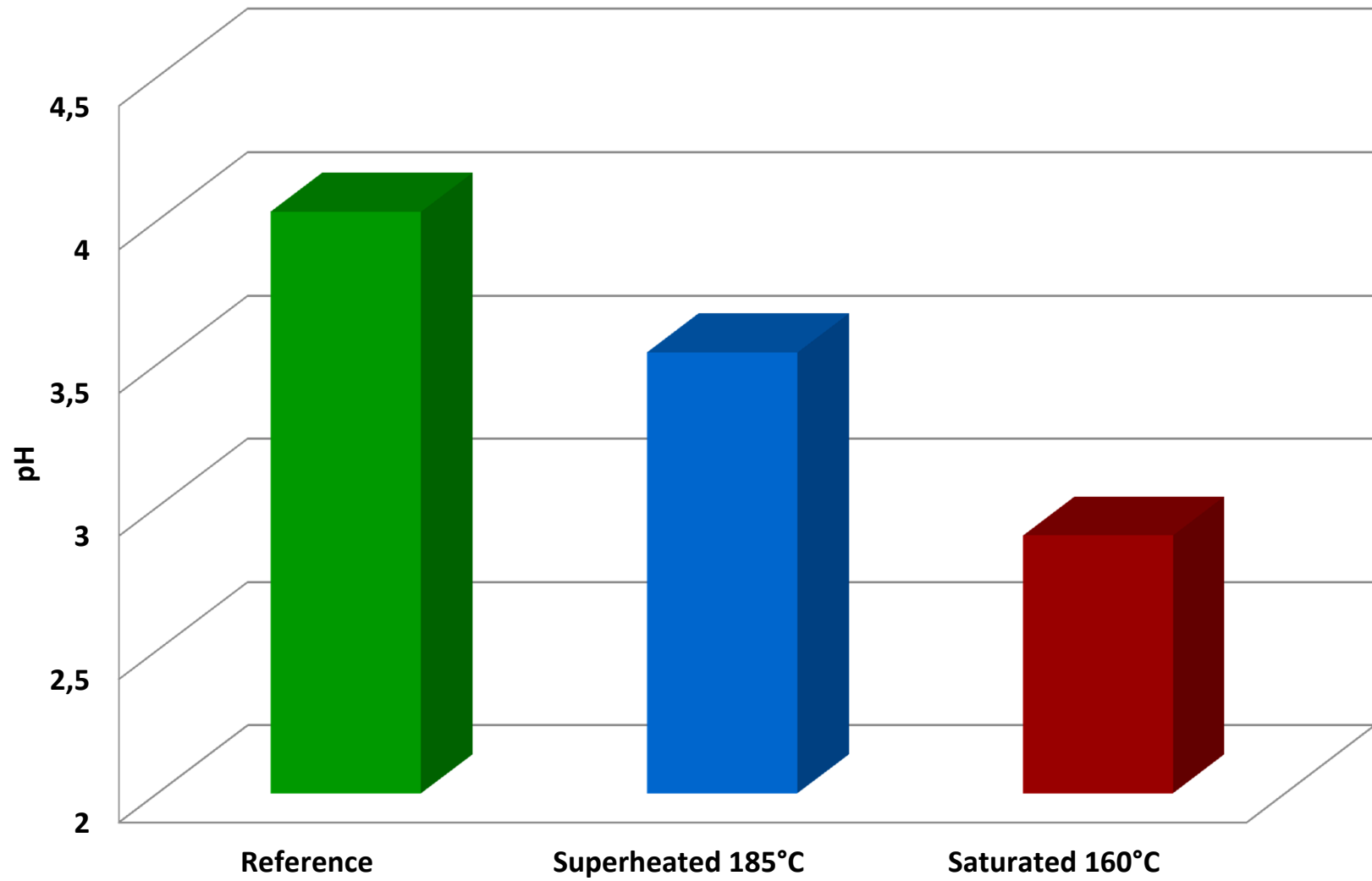
Equilibrium moisture content (EMC)



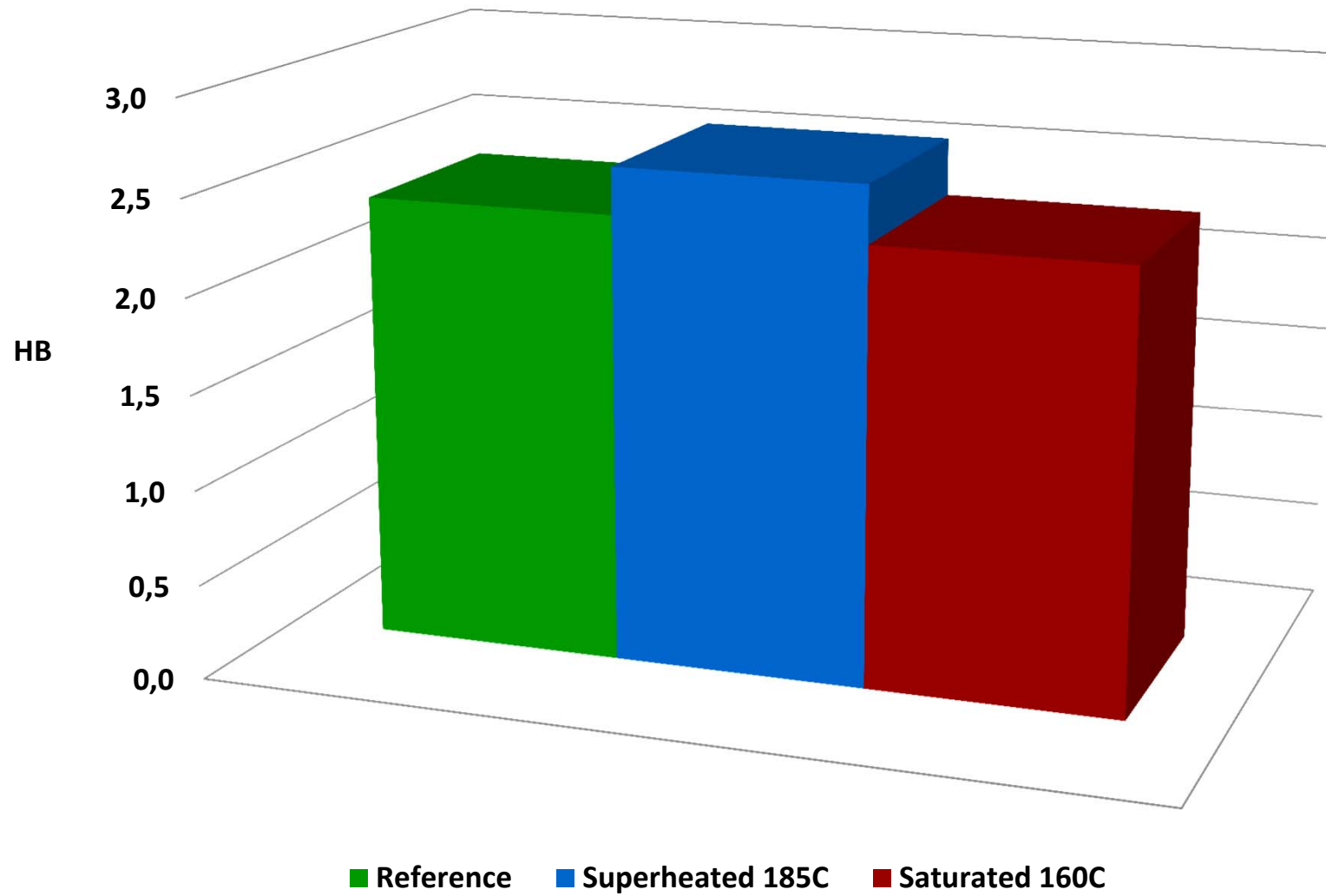
Dimensional stability



Acidity



Hardness (Brinell)



Conclusions

- Thermal treatment in saturated steam darkens the colour of wood in lower temperature compared to treatment in superheated steam.
- As expected both thermal modification methods result in lower EMC. Reduction of EMC was around 30 – 40 %
- Thermally modified wood is increasingly dimensional stable the higher the RH%.
- Birch treated in saturated steam is more acidic than birch treated in superheated steam.
- No significant difference in hardness.

Acknowledgements

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- Thermo Plus AB

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