Wood Plastic Composites Made with Thermally Modified Birch Wood Residues

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Forest

Sawmill

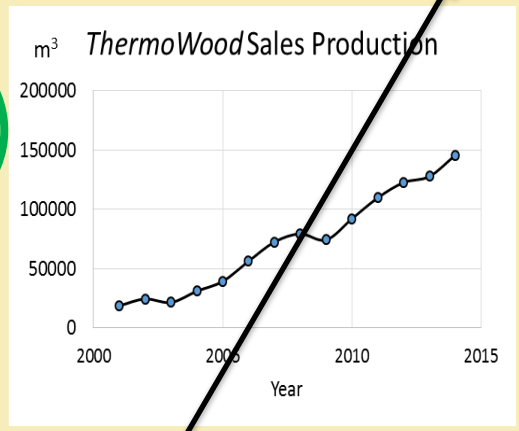
Sawmill products

Thermal modification (TM)

Residues
- Bark
- Wood chips
- Sawdust
- Shavings

TM wood products → Consumer

TM wood residues
- Sawdust
- Damaged boards (rejects)
- Shavings



Uses
- Energy
- Wood composites (OSB, WPC etc.)
- Biorefinery

Relatively small amount of research has been done.

Production of wood plastic composites!

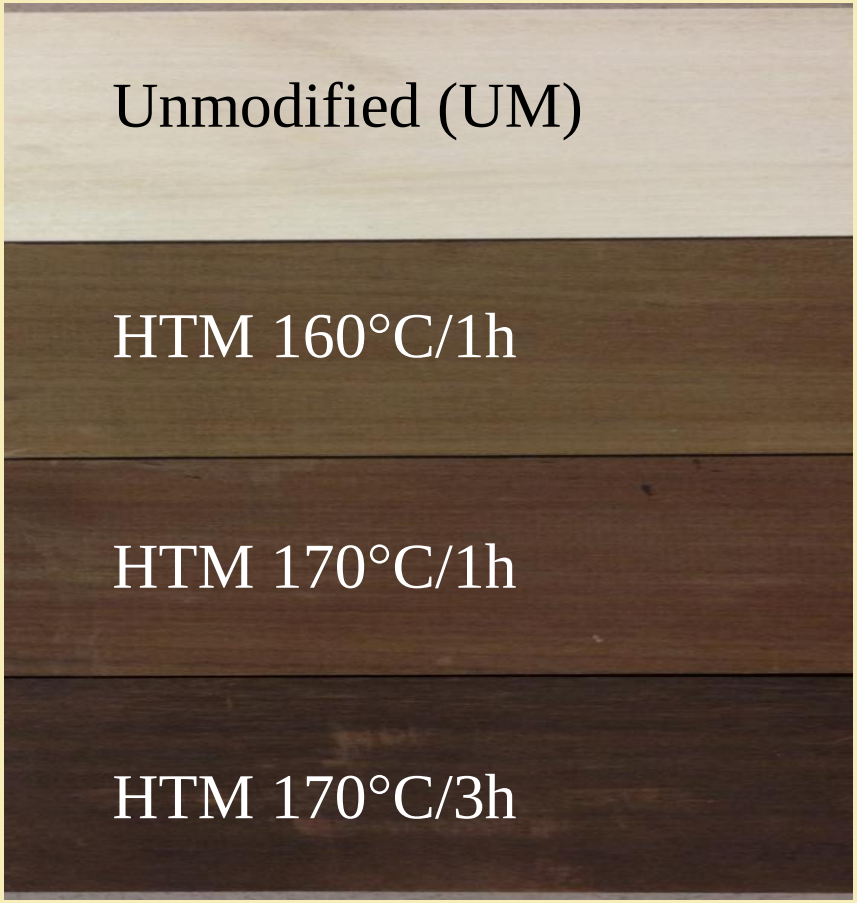
Aims of this research

To find out:

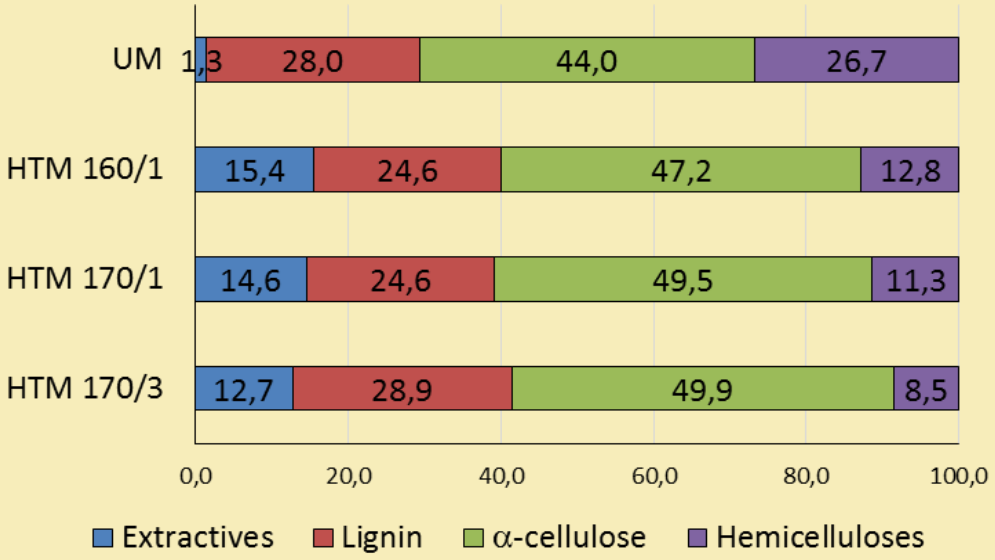
- If thermally modified wood residues can be used to manufacture competitive wood plastic composites,
- Does modification regime influence the properties of wood plastic composites

Hydrothermal modification (HTM)

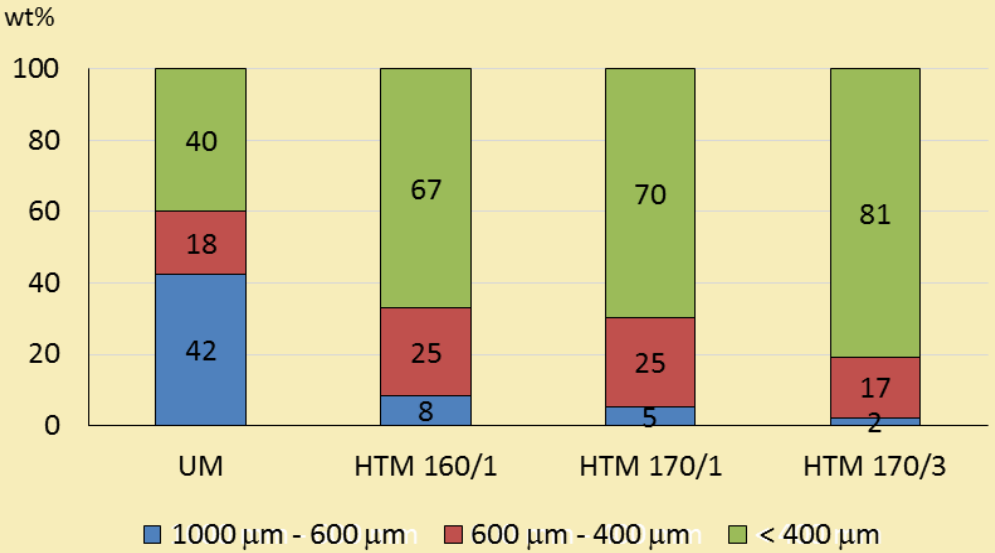
Birch wood



Chemical analysis of wood



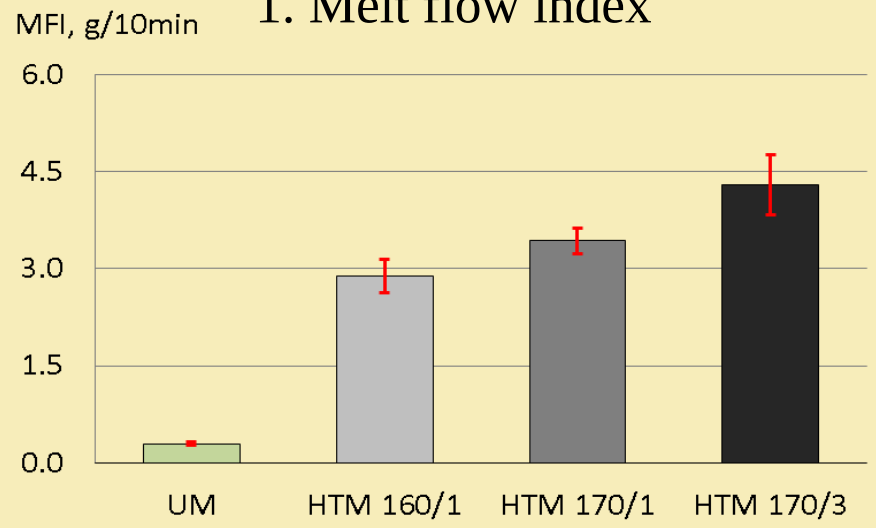
Wood fiber fractional content



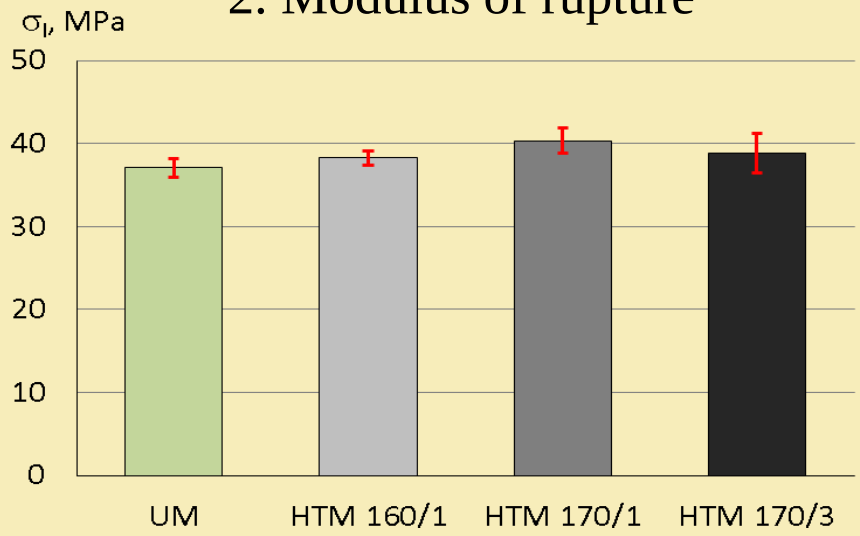
WPC composition

- Birch wood fibers (UM or HTM) → 50 wt%
- Polypropylene → 49.2 wt%
- Thermal stabilizer → 0.8 wt%

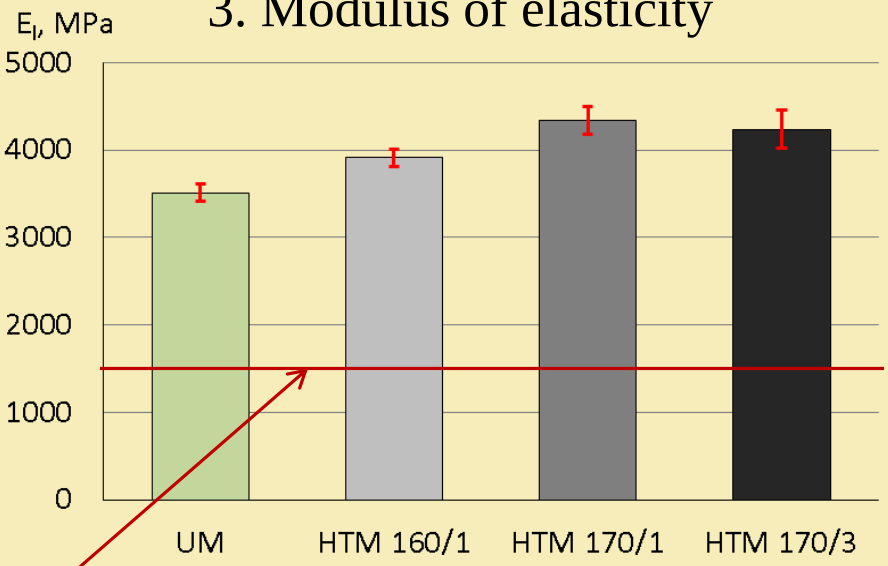
1. Melt flow index



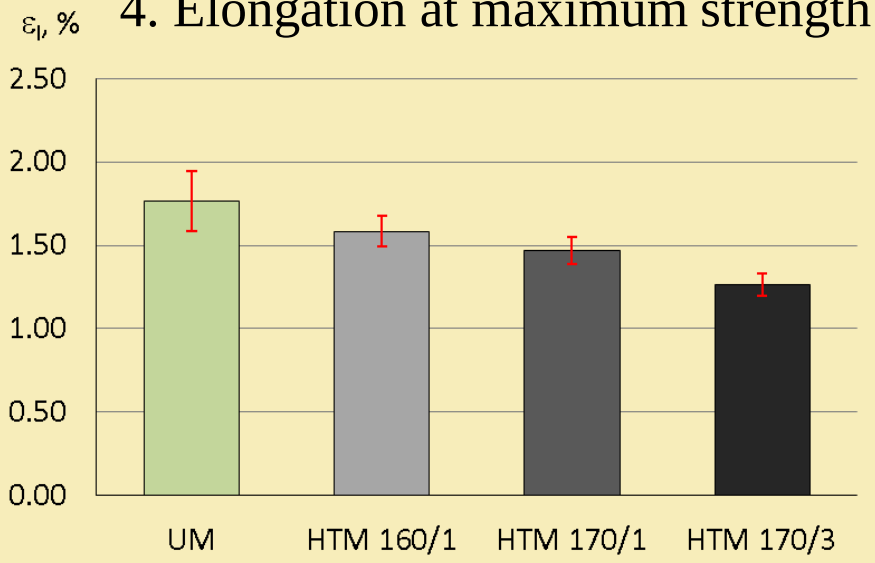
2. Modulus of rupture



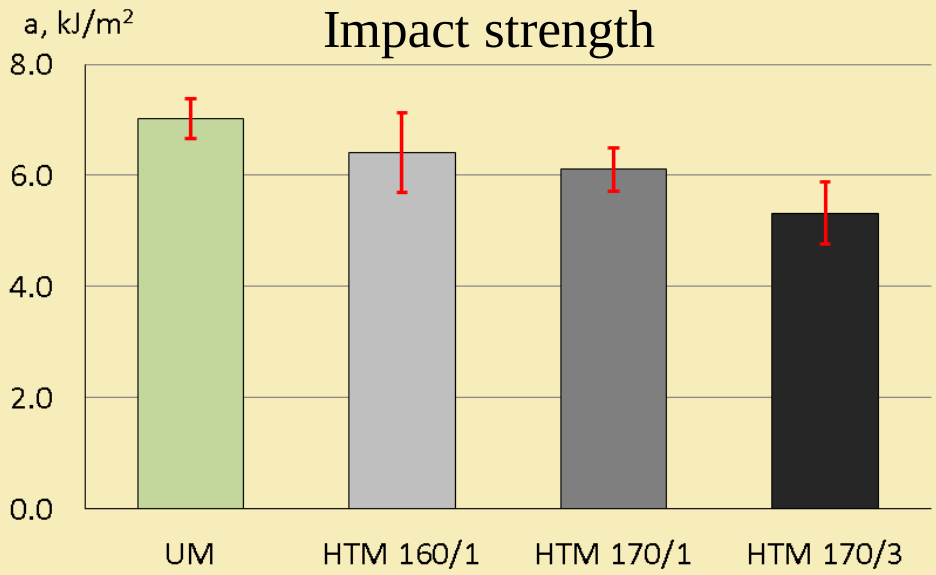
3. Modulus of elasticity



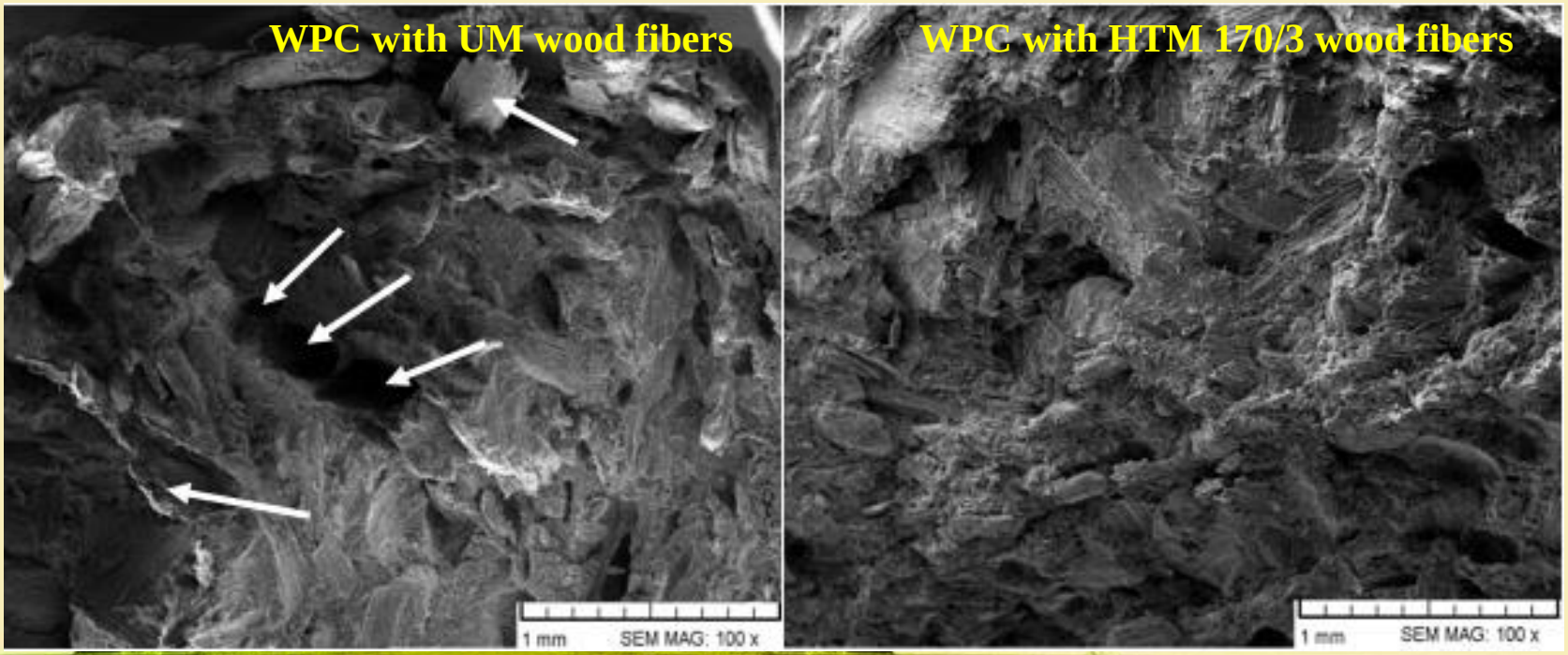
4. Elongation at maximum strength



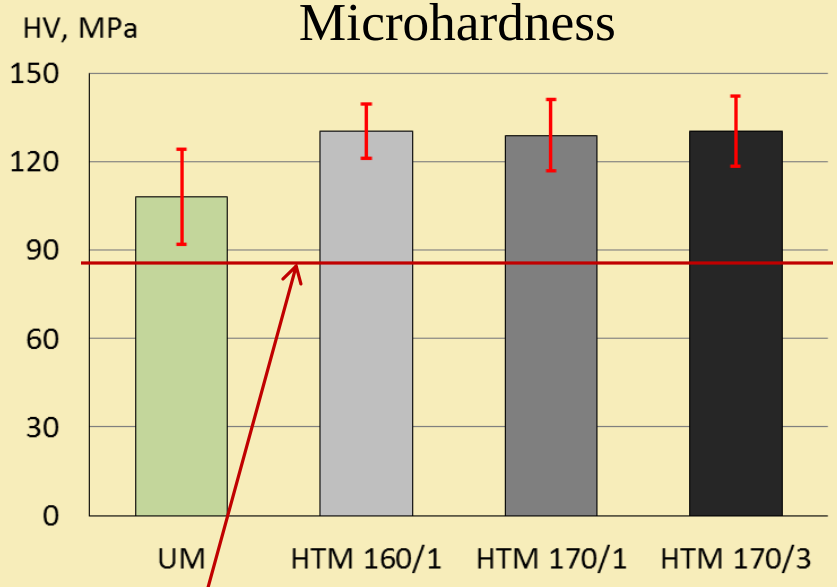
For polypropylene E_l = 1550 MPa



Fracture surface of impact strength specimens

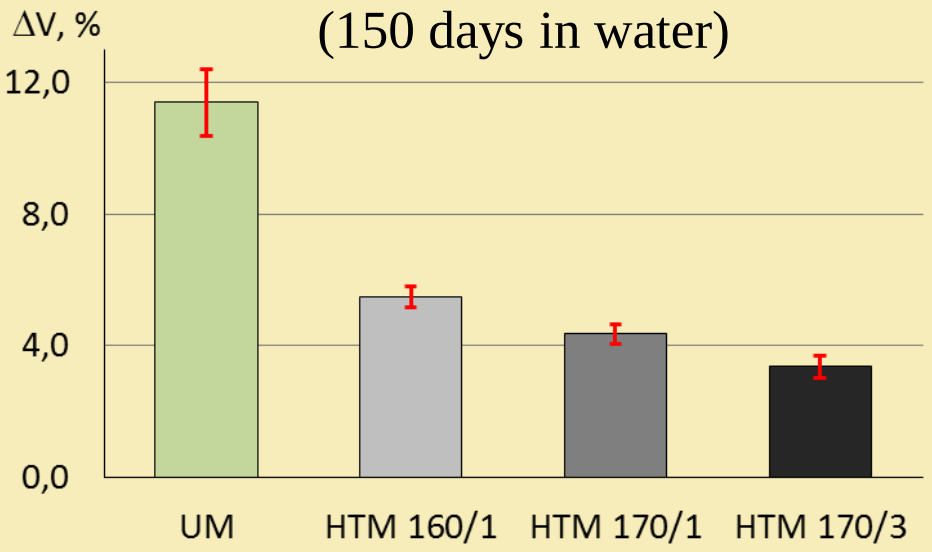


Microhardness

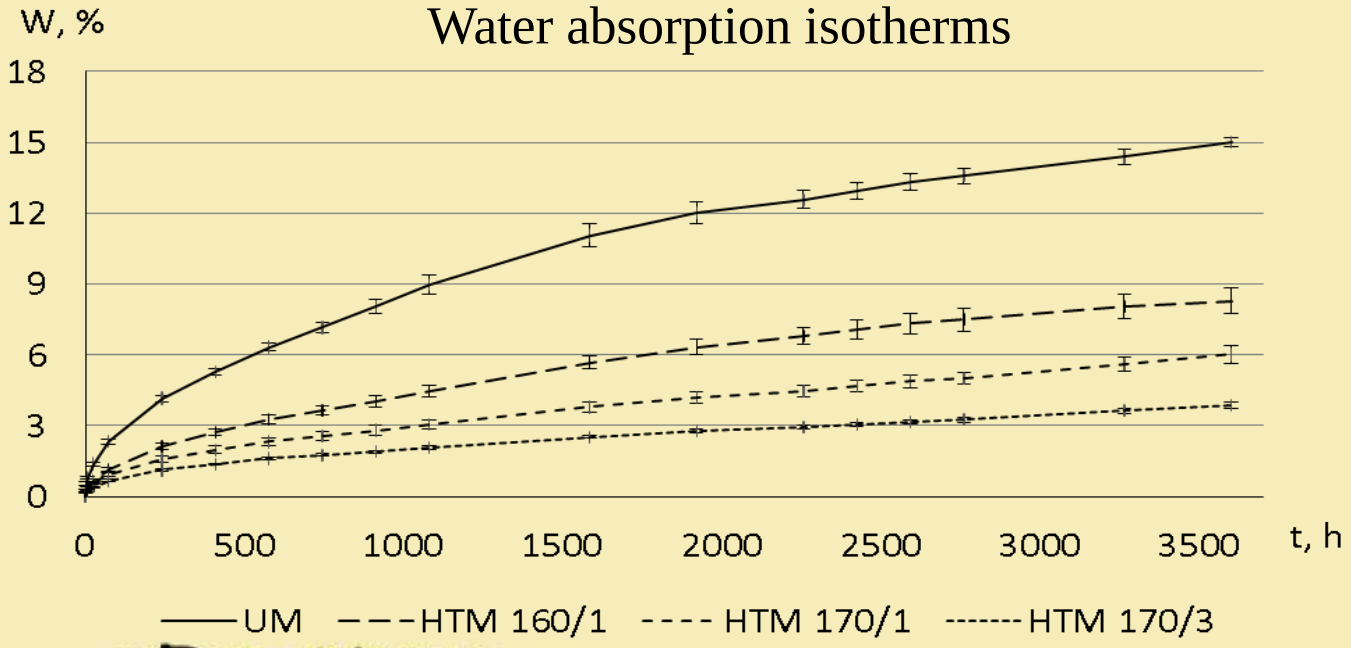


For polypropylene HV = 87 MPa

Volumetric swelling (150 days in water)



Water absorption isotherms



Conclusions

- Thermally modified wood residues were successfully used in WPC production, and because of the improved properties, they could be competitive with currently produced WPC materials.
- Thermal modification regime does influence the properties of WPCs.
- All the tested properties, except impact strength, were better for WPCs with TM wood fibers, compared to WPC with UM wood fibers.

Acknowledgements

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Thank you for your attention!