

THE INFLUENCE OF THE TEMPERATURE ON THE MECHANICAL PROPERTIES OF WOOD

INTRODUCTION:

Wood thermal treatment is developing significantly nowadays all over the world. The main two improvements of the thermal treatment are improvement in resistance to water absorption and dimensional stability. On the other hand, thermal treatment can harm mechanical properties. The effectivity of the thermal treatment depends on wood species and process conditions and also it has a stronger effect on some properties. Also, the severity of the thermal treatment of different species can be significant. One of the most common mechanical tests is the impact test. The thermal treatment makes the wood more brittle and consequently, it affects the absorbed energy in impact bending tests. This research was about studying the effect of the thermal treatment on the behaviour of wood under impact and reach a pattern for effectivity of the thermal treatment on different aspect of the impact strength of wood.

Materials and methods

Five species of beech (*Fagus sylvatica* L.), oak (*Quercus robur*), spruce (*Picea abies*), ash (*Fraxinus excelsior*) and Larch (*Larix decidua*) were selected for this research.

THERMAL TREATMENT

Each wood species was divided into three groups, group with no thermally treatment (N), the group with thermally treatment in 180°C (L), and the last group was treated in 220°C (H). After thermal treatment, 336 test samples of dimension 20*20*300 mm were prepared from the boards.



Fig 1. the thermally treated samples of ash, beech, larch, oak, spruce (from left to right) for untreated, 180°C and 220°C treated groups (from up to bottom)

IMPACT TESTS

The tests were carried out on the drop-weight impact testing machine DPPest 400 (Labortech s.r.o., CZ). Due to the extreme high speed of the process of the impact, a set of high-speed (HS) equipment with a frame rate of 50000 fps rate was used.



Fig 2. The thermal treatment processing, and a HS equipment.

DIGITAL IMAGE CORRELATION METHOD

Then, the images were processed. The digital image correlation method was considered for processing. An effective software called Vic-2D v. 2010 (Correlated Solutions, Inc.) was used.

<https://www.ldf.mendelu.cz>

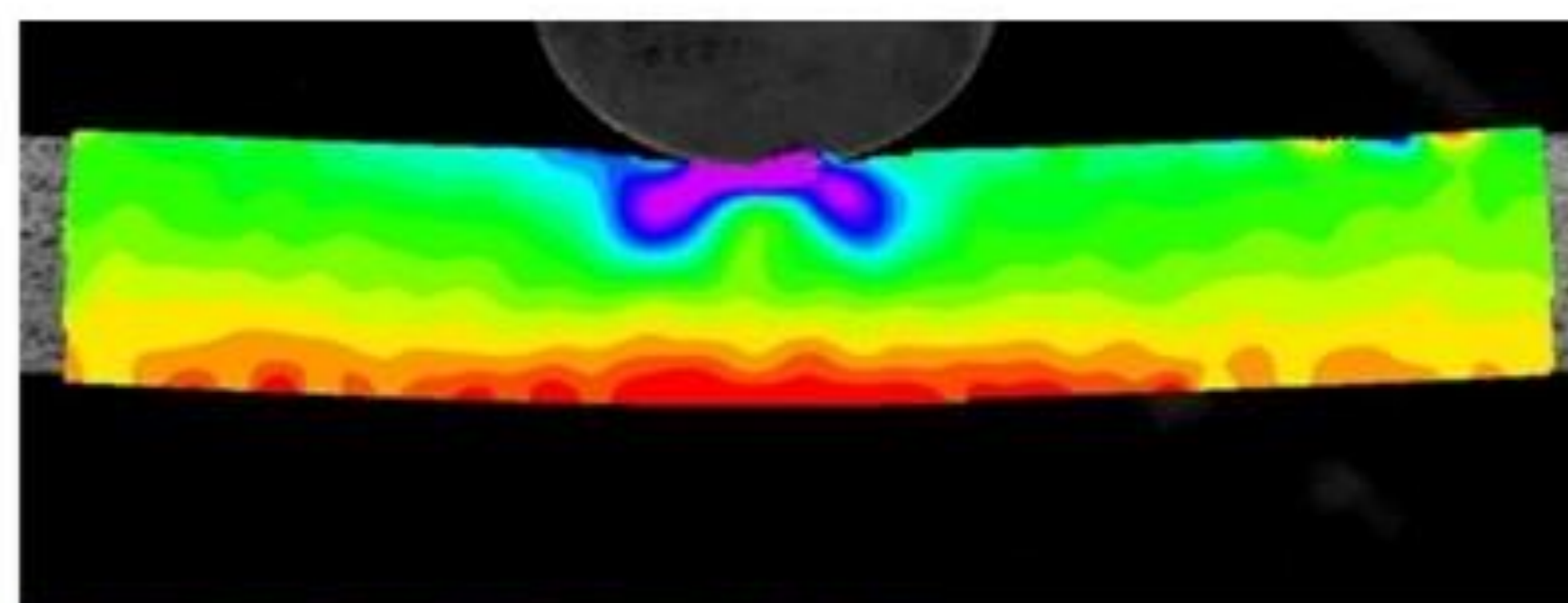


Fig 3. a view of the DIC software (VIC-2D)

RESULTS

The results showed that the total work required for the breakage decreases with the severity of the thermal treatment.

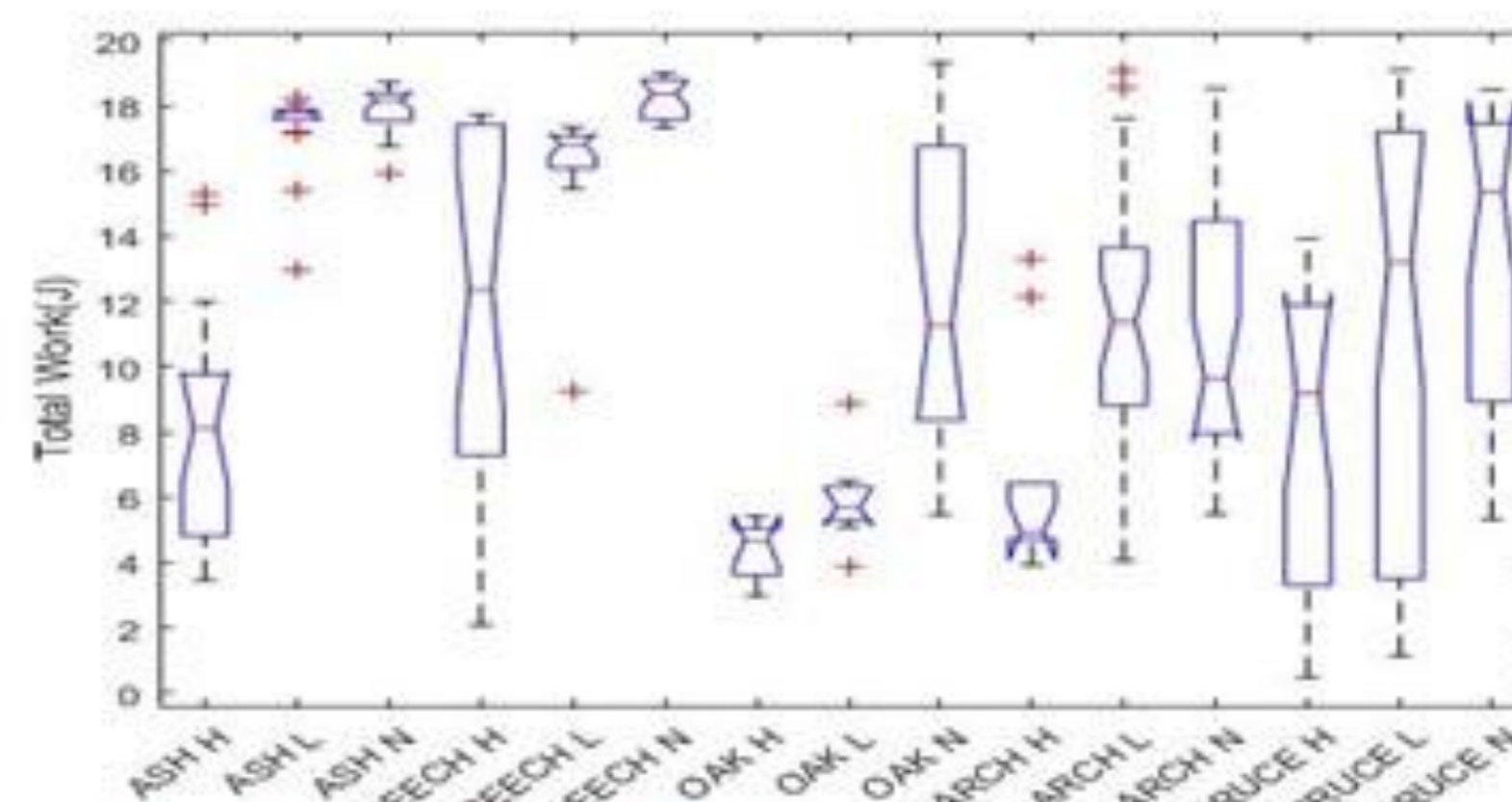


Fig 4. The total required work for the groups

It can be realised that the thermal treatment has sever negative effect on the flexibility of the beams.

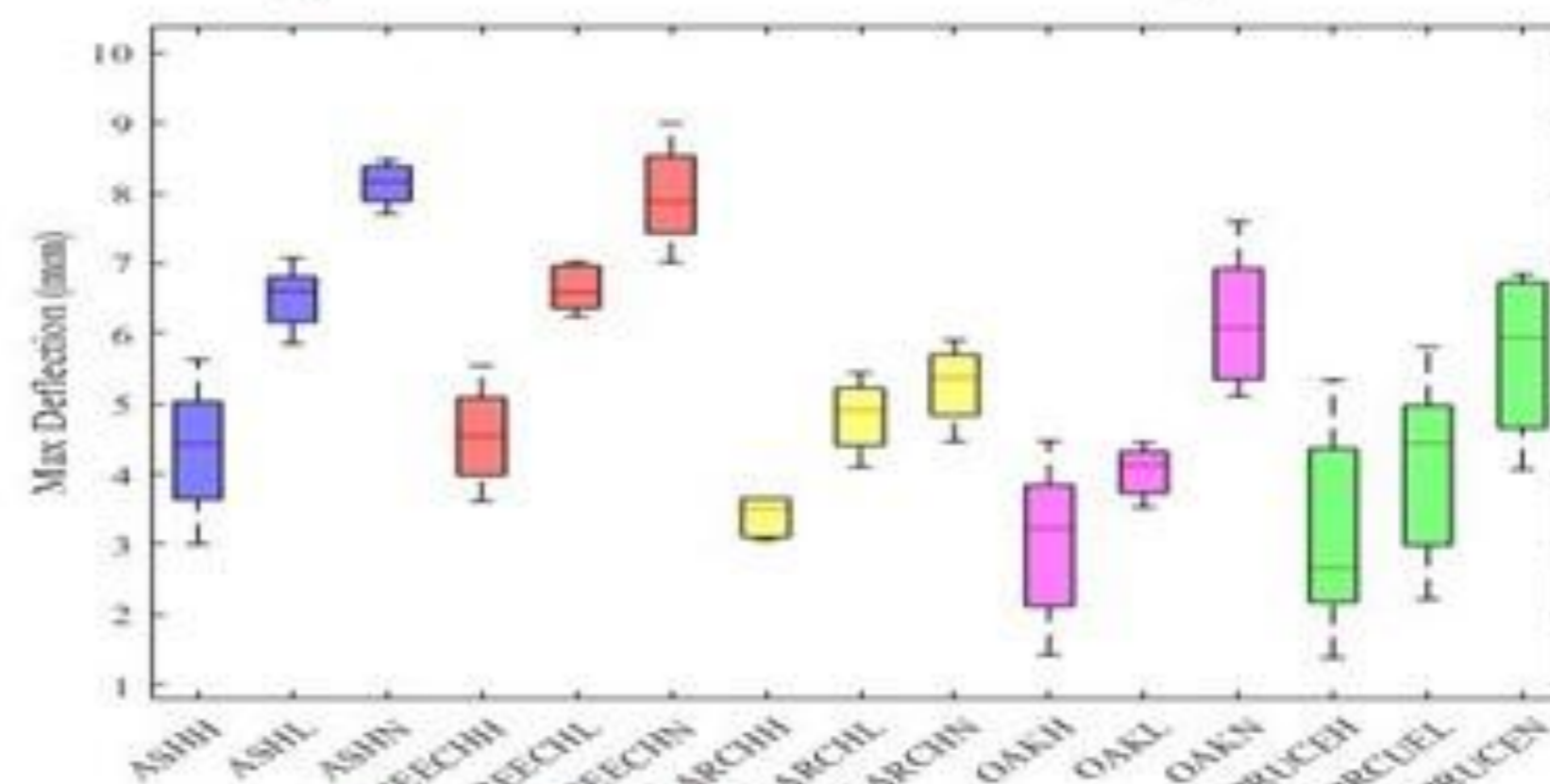


Fig 5. Max Deflection of the beams up to crack initiation

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