THE COMPARISON OF TESTING METHODS FOR TIMBER INTENDED TO STRUCTURAL APPLICATIONS

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BACKGROUND

Both wooden construction industry and engineering wood products are constantly gaining a popularity on a global scale. Their wide application results from the good strength, light weight, durability and elasticity. The timber intended to structural applications requires strength grading in order to determine modulus of elasticity (MOE) parameter. The higher MOE value the timber is characterized by the wider application it may have. The strength grading can be done with the use of visual inspection or machine-assisted methods. The visual assessment is a very time-consuming process demanding many people involvement. On the other hand, there are more efficient devices which are able to grade the timber faster. Moreover, the machines are non-destructive and able to adapt for full size structural elements grading.

The aim of presented study was to compare the results of pine timber strength grading using two different machine-based methods.

MATERIALS AND METHODS

The studies were conducted on 133 pieces of pine (*Pinus Sylvestris* L.) timber obtained from Forest Division Kalisz Pomorski (Poland). After determining their dimensions the modulus of elasticity was investigated using two methods:

- MTG device from a Dutch company Brookhuis Electronics BV. This device determines MOE parameter based on the frequency of timber vibrations caused by dynamically hitting the tested timber.
- „Bending" method involving the determination of the deflection for a given load (Fig. 1). The preliminary load was 134.9 N and at that value the deformation sensor was reset before increasing the load to 517.5 N. Each timber was deflected eight times, the values were recorded for five final measurements and recalculated according to Bauschinger's formula.

Results were analysed using STATISTICA 13.0 software.

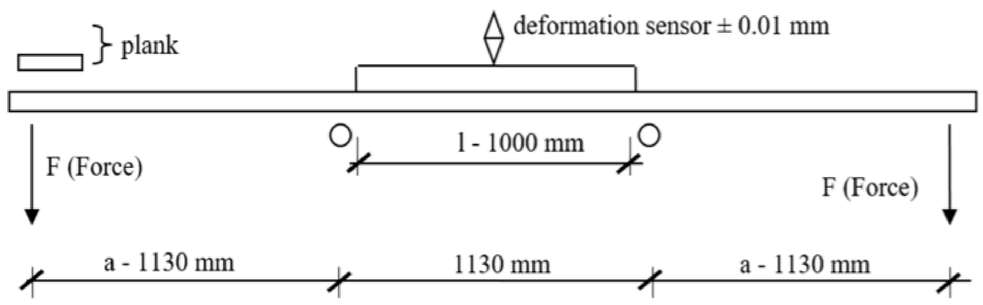

Figure 1. *The setup for MOE investigations*

RESULTS

- The results of density measurements are presented in Figure 2. There are no reason to reject the hypothesis that the density distribution is normal. Most of the analysed pieces of timber were characterized by a density range between 500 and 650 kg/m^3.

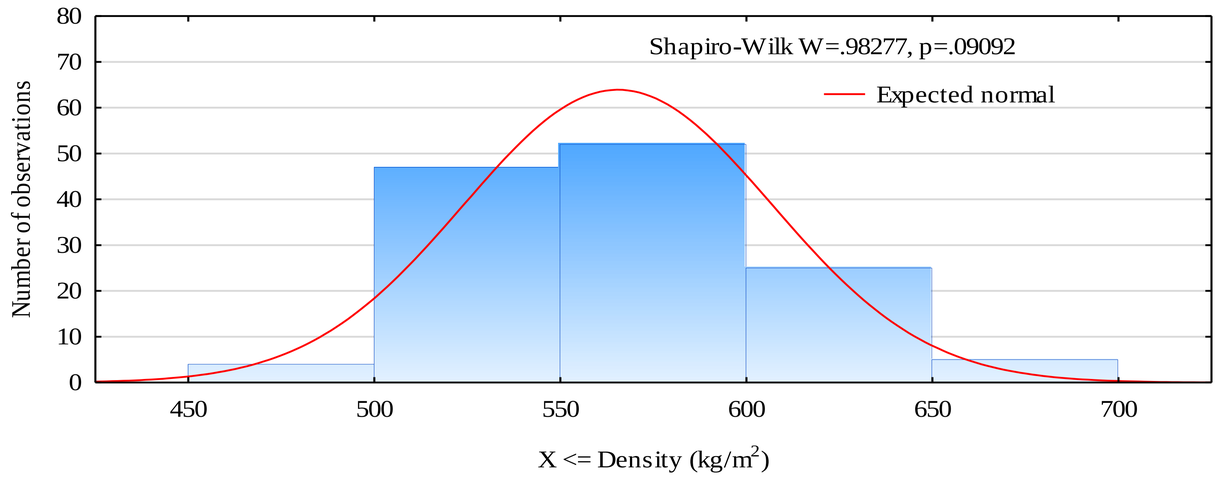

Figure 2. *The distribution of timber density*

- The results of MOE investigations are summarized in Figure 3. Studies have shown that the results obtained with Brookhuis Electronics BV device reached a higher values (by about 7.5%). Differences between the results were statistically significant.

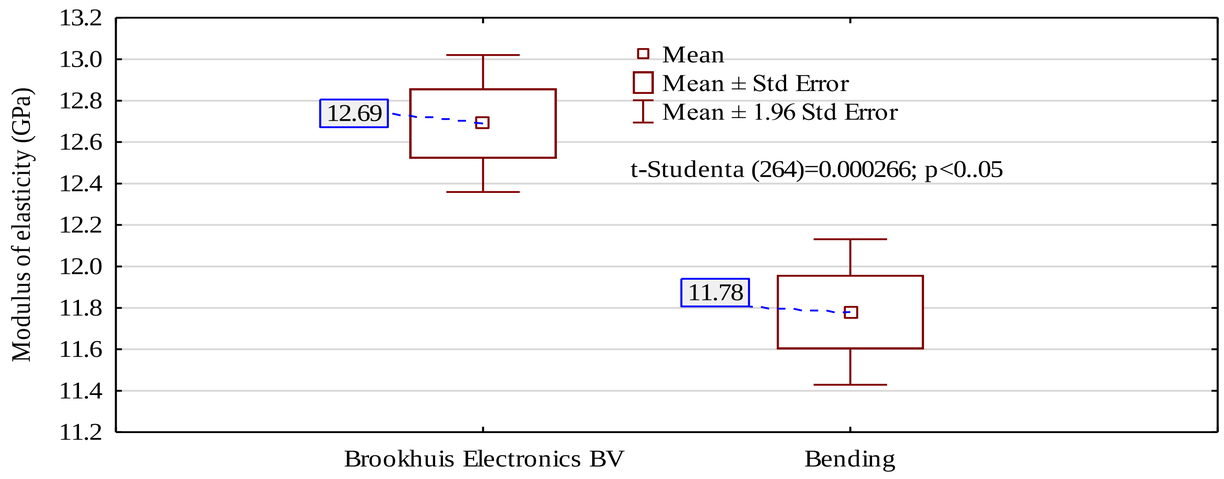

Figure 3. *The results of modulus of elasticity investigations*

- There was no linear correlation between the results obtained with Brookhuis Electronics BV device and the mechanical testing on the experimental setup (Fig. 4).

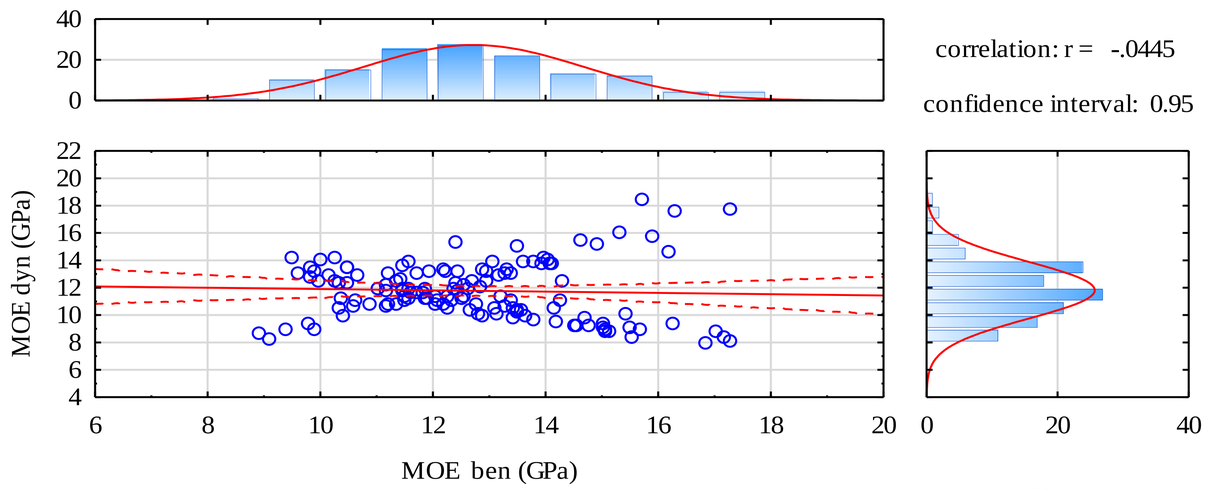

Figure 4. *Correlation between the results obtained with the different testing methods*

SUMMARY

- Studies have shown that even when using two methods for timber testing called machine-grading, the MOE results depend on the type of device used.
- The advantages of Brookhuis Electronics BV method are: less time-consumption, less additional space for lumber test stand needed, less people needed for conducting the investigations.

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