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Occurrence of shake in oak (Quercus spp.) and it’s effect on flooring top-layer quality

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ABSTRACT

Oak (Quercus spp.) is generally preferred wood species as surface material in flooring products realization. The presence of defects such as cracks limits the utilization of the raw material and ultimately, limits the competitiveness of wood in the flooring market when compared to other materials. The objective of this study was to develop the theoretical aspects for crack-type identification based on the appearance of the sawn top-layer lamellas and evaluate the influence of crack occurrence on the quality of flooring top-lamellas. The results of this study provide an insight for crack-type identification on the surface of oak (Quercus spp.) flooring top-lamellas and wood quality optimisation aspects.

1. Introduction

Cracks such as heart, star and ring shake are common for hardwoods e.g. oak (Quercus spp.), maple (Acer spp.), beech (Fagus Sylvatica L.), chestnut (Castanea Sativa M.). The presence of these shakes in the material for products such as solid or layered flooring is accepted only for the lowest grades and to a certain extent (SS-EN:14389 2017). Herein, most of the shake in oak (Quercus spp.) is abiologically induced under factors such as wind and frost (Richter 2010). Therefore, their presence in the raw material represent an intrinsic condition and woodworkers must possess all the background knowledge for best material handling practices.

Wood products have a positive impact on human perception (Nyrud and Bringslimark 2010). Although, defects such as “big” and “dark” knots in contrast with the “light” and “warm” texture of the wood are generally seen as disturbing for the end-users (Broman 2000). Therefore, it can be induced that surfaces with large cracks filled by dark putty are rather undesirable to the human eye. Thereby, the aim of this study was to assess the presence of defects on oak (Quercus spp.) flooring top-lamellas with the focus on ring and star-shake characterisation and its effect on the material quality.

2. Material and Methods

For this exploratory study, 16 oak (Quercus spp.) 1-strip flooring top-layer lamellas were selected after the drying step in a running industrial production. The selection of lamellas was made randomly with the sole condition of defect presence. The lamellas had nominal dimension of 2400x225x4.5mm and were conditioned at ~7% MC. Lamellas were inspected on the external outer surface corresponding to a longitudinal-tangential (L-T) plane in wood. Knots, cracks (including shake) and other defects such as bark pockets and rot were manually measured and documented by type.
3. Results and Discussion

Results of lamellas inspection show that, to some extent, it is possible to separate between different types of cracks based on the L-T section of wood. The two types of shake (ring and star-shake), have rather differently properties although in all three boards where ring-shake was detected, star-shake was present too. The vice-versa was not true. The specific of ring-shake is its extensive length along same annual ring followed by the wood discoloration in the zone adjacent to the crack, due to enzyme attack (Richter 2010). The star-shake in turn, crosses several annual rings, is shorter in length and wider due to the “opening” effect during drying. However, ring and star-shake in the studied oak lamellas were not the only sources of lamellas degrading (fig.1). In a quarter of lamellas, end-cracks were the grade-determining factor. This is due to cracking of weak material close to pith and association of the heart shake defect. However it can not be said that all end-cracks were heart shakes since the position of lamellae within the log is unknown and in most cases end-cracks are believed to be triggered by the tangential shrinkage strain (Niemz 1993). Bark, rot and loose dead knots accounted for 30% of the degraded lamellas and are associated with poor forestry operations. Drying checks and fresh-knot cracks can be attributed to the material mishandling errors and accounted for 18% of the inspected lamellas. The mean length of the most significant cracks in oak are presented in fig.2. As it can be observed, ring-shake is by far the most severe defect and future studies must evaluate the best material handling practices regarding this defect. Yet, this study represents an initial attempt to quantify the occurring defects in oak. Future studies should ascertain a statistical validation of the observations and develop methodologies for visual grading systems with crack type identification.

Bibliography