Foreword

It was a challenge to gather international specialists from all over the world on a key topic for industrial uses of wood. For most of them, their expertise is not only academic but also industrial, involving careers that were shared between universities, technical centers, and industries.

The scope of this textbook offers a broad coverage of new results in research and development and industrial applications on all the different kinds of wood products, their ways of manufacturing, characterization and usages, and machining.

After an overview on wood composites (chapter 1), the wood and fibers panel technology is presented in chapter 2, including the influence of basic properties of wood and adhesives and the manufacturing parameters and equipment. An interesting focus is made on the way to use the concept of density profiles.

The wood-based panel industry is a heavy industry with high production capacity. Chapter 3 introduces the new on-line testing methodologies of panels during their manufacturing. An interesting survey of all NDT (Non-Destructive Testing) technologies, covering most of the panel’s parameters is given, from physical to chemical properties (i.e. formaldehyde content!).

All the wood products contain adhesives, which are, until now, mostly synthetic. To achieve sustainable development in this industry, there is a trend to develop “green” adhesives able to release much less formaldehyde. Chapter 4 provides a description of the synthesis and ways of using different bio-based adhesives, with tannins, lignin, proteins, carbohydrates, unsaturated oil, and gluing without glue, a brand new process under development in Europe.

Although a lot of research has been conducted on ultrasonic techniques, the industrial applications are not well developed, even though ultrasonic techniques are the most versatile NDT technique for the characterization of all engineered wood products. Chapter 5 emphasizes the history of the use and recent developments of “ultrasonics,” namely in adhesive curing and detection of defects in solid wood products.
Chapter 6 focuses on a new ultrasonic NDT methodology for bonding quality assessment in glued laminated timber. The air-coupled ultrasound-testing prototype is able to transmit ultrasound signals through up to 500 mm thick glulam. It allows the understanding of the wave propagation phenomena in thick laminated timber with both analytical calculations and finite-difference numerical simulations.

Great improvements on tree log analysis have been achieved with the use of medical imaging techniques like CT X Scanners and Magnetic Resonance Imaging (MRI), which are described in Chapter 7. Operational principles, sampling conditions, and data outputs are given by the authors to be used in industrial and research applications.

Chapter 8 deals with plant fiber composites, mixed or not with wood. A review of the research and development work on the influence of relative properties of feedstock and manufacturing processes of boards is presented. The compatibility between macro and micro structures and chemical composition of wood and plant fibers is a key parameter.

The last chapter is original, as it is not very frequently treated in such textbooks on manufactured wood composites, in spite of the strong influence of tool wear on the quality of wood products. An understanding of tool wear, with the different phenomena occurring during the cutting action is detailed, giving the wear patterns that characterize the life of tools.

Congratulations to the editors and authors for this interesting book showing three main domains of studies of wood and plant composites: gluing/pressing, complete NDT survey, and machining. This textbook will be very useful for board manufacturers in industry.

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