

Management of wood production residues as wholesome products - case study

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Abstract: *Management of wood production residues as wholesome products - case study.* The aim of the analysis is to check the possibilities of better use of post-production wood residues, which as a result of these activities gain the same value as full-value production materials. This includes producing high-quality products from them having in mind innovation, design and ecology. The circular economy and sustainable development strategies are new concepts and objectives of the EU material strategy. There is no turning back from these actions. They will be forced by the requirements and recommendations of the EU. Therefore, it is better to get used to them and to the activities behind them. An example should be taken from the new course at the University of Cambridge - Judge Business School.

Keywords: innovation, design, ecology, upcycling, smart design, production, sustainability, green product

INTRODUCTION

The innovation, design and ecology are in the rational use of wood production residues. It is based on extending the life cycle of wood raw material by transforming production residues into high-quality products using intelligent design. The eco-innovative methods of managing wood production residue are essential. Eco-design and development of a sustainable product are creation methods to reduce the negative impact of products on the environment. Eco-design is also referred to as Smart Design and is directed to the management of wood production residues.

The upcycling of post-production residues is a new quality of thinking. It is an element of the novelty together with Smart Design, which is the management of wood residues just in the form of upcycling in relation to the cascade wood processing. Wood production residues should be transformed directly into finished products with high-quality design, and not into semi-finished products.

Conditions “no waste” at this higher level than before force adaptation of enterprises to the expressed EU requirements and national regulations in the field of the use of secondary raw materials for production. Some regulations have already been notified and others are under preparation (EU1 2020, EU2 2019, EU3 2020). The new course, entitled *Circular Economy and Sustainability Strategies* (<https://programs.emeritus.org>), which will start on University of Cambridge – Judge Business School proves the novelty, but also the importance of the issue. Due to the fact that the subjects are forward-looking, a lot of people do research and strategy. The bellow mentioned publications are examples of this. Neykov, Antov and Savav (2020) took care of wood-based panel industry. According to them the enhanced technological possibilities to utilize wood waste and residues in the production of wood-based panels can help towards the transition to a circular, low-carbon bioeconomy. The cascading use of wood resources, defined as “the efficient utilization of resources by using residues and recycled materials for material use to extend total biomass availability within a given system” is one of the leading principles for achieving this goal. The wood-based panel industry is characterized by significant amounts of waste and residues that present a great volume potential for cascading. Silva et al.

(2021) have already taken care of the particleboards. According to their life cycle assessment of particleboards made from recycled wood and bio-resins reveals that all scenarios for the production of particleboards in a CE approach are environmentally benign alternatives, reducing up to 95% of the environmental impacts to human toxicity, abiotic depletion and other impacts compared to the traditional and linear scenario. The best circular scenarios are more sustainable than linear scenarios, especially for the cases of particleboards which are made with medium densities involving eucalyptus or pinus wood wastes and PU polymer. In the same time Luttenberger (2020) presents waste and circularity indicators for Croatia, analyses national policies, targets, achievements and EU recommendations, and proposes the measures which would accelerate Croatia's path towards circular economy, resource efficiency, reduction of marine litter in the Adriatic and bio economy. The model is applicable to other countries in transition and those which still rely on landfilling and linear economy concept. These topics are also devoted to large international conferences and congresses (<https://gbs2020.net>).

The aim of the analysis is to check the possibilities of better use of wood waste, which includes innovation, design and ecology towards making high-quality products from them.

MATERIALS

The research materials are residues from the wood industry according to the following technology processing path. First residues appear on the beginning, when the round wood comes from the forest. Just before first technology processing there are already pieces which could not be processed in sawmill. Activities are related to analysis of individual groups of research materials, which covers:

- round wood from the forest: too small for sawmills, too large, misshapen, cracked, with blue stains,
- formed during sawmill processing: hollows, biological corrosion, wormed,
- next in wood processing is seasoning, during which there are a lot of residues remaining and not matching to the next stages of cutting,
- wood residues from seasoning: logs that have cracked during seasoning, friezes that: have cracked, have become distorted, bark fragments that have become wormed, have undergone biological corrosion as a result of seasoning, discoloured,
- during drying there are a lot of residues due to fragility of wood. Wood residues from drying are friezes: which have cracked, which were deformed, that have become discoloured,
- during production, residues appear in many forms. Wood residues from production: damaged by the machine, ends and cuttings of slats,
- after production residues are often underestimated to reuse although they are very precious because of ready stage of form. Wood residues after production: after-sale tips, old exhibitions, old stencils.

METHODS

The method to implement the aim is based on:

- improving the use of wood raw material by using production residues,
- reducing the need for wood raw material (improving the rational use of wood material),
- saving the natural environment in terms of reducing the need to obtain wood raw material,
- protection of the natural environment by recycling production residues.

Methods to adjust enterprises to the EU requirements and recommendations regarding the origin of secondary raw materials are based on:

- studying and analysing the possibilities of adjusting each enterprises' production and technology regarding the cascade use of wood materials,

- studying the possibilities of applying the circular economy of raw materials in wood production,
- investigating the possibility of transforming production residues into high-quality products,
- using the smart design method to manage wood production residues,
- study of the possibilities of applying the circular economy in wood production.

RESULTS

At this stage, it can be expected to discover the possibility of creating high-quality wood products from production residues using an intelligent design research program combining various fields of science and art based on an intensive process of creating, testing and refining all key aspects of the product. Moreover, it enables development of a sustainable eco-design method for high-quality products from post-production wood design residues. Production of high-quality products and attractive designs from wood residues, as a result of research using upcycling in cascade wood processing is possible and necessary.

Moreover it is expected to improve the economic conditions of enterprises through better use of production residues. Exploring the possibility of creating high-quality wood products from production residues using an intelligent design research program combining various fields of science and art is based on an intensive process of creating, testing and refining all key aspects of the product.

Development of a sustainable eco-design method for high-quality products from post-production residues is another result of actions.

CONCLUSIONS

Innovation, design and ecology in the management of wood production residues are of great importance both for science and practice, especially in the field of: sustainable development, economic, environmental protection and ecology, social, development of cleaner and waste-free production of the wood industry. The basic results to be achieved are:

- sustainable development,
- economic,
- environmental protection and ecology,
- social,
- development of cleaner and waste-free production of the wood industry.

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Streszczenie: *Zagospodarowanie drzewnych pozostałości produkcyjnych jako pełnowartościowe produkty przemysłowe – studium przypadku.* Celem analizy jest sprawdzenie możliwości lepszego wykorzystania poprodukcyjnych pozostałości drzewnych, które w wyniku tych działań zyskują taką samą wartość jak pełnowartościowe materiały produkcyjne. Obejmuje to wytwarzanie z nich wysokiej jakości produktów z dbałości o innowacyjność, wzornictwo i ekologię. Gospodarka o obiegu zamkniętym i strategię zrównoważonego rozwoju to nowe koncepcje i zamierzenia strategii materiałowej UE. Od tych działań nie ma odwrotu. Zostaną wymuszone wymogami i zaleceniami UE. Dlatego lepiej przyzwyczaić się do nich i do działań za nimi stojących. A przykład należy wziąć z nowego kursu na University of Cambridge – Judge Business School.

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