

## The modern methods of wood security and threats for humans and environment

JANUSZ GRABARA

Faculty of Management, Czestochowa University of Technology

**Abstract:** *The modern methods of wood security and threats for humans and environment.* Wood is a material, which is used widely by individual users. It has been used for the production of furniture, decorative elements, floors or terraces. Especially in the case of terraces floors, wood used to its produce must be characterized by a high resistance, not only to atmospheric conditions but also in daily use. This caused, that in addition to traditional methods of wood protection and preservation, a WPC (Wood Plastic Composite) had begun to be used. This article presents the characteristics of a WPC, detailing its main advantages, but also underlining features, which show that this product is not entirely environmentally friendly.

*Keywords:* Wood Plastic Composite, wood, environment, advantages, disadvantages

“Wood as a raw material has no equal. It is not only beautiful, but has a number of specific features: it is a natural resource, fully renewable, healthy, environmentally friendly, is distinguished by diverse natural advantages and specifications”[1].

Wood is a material which is very widely used in Poland - it is mainly used in the sawmill industry, in the production of hardboard and in the pulp and paper industry [2]. Wood, was and still, is very popular in the furniture and finishing industry as well. Like any natural resource, wood is also prone to common use and the passage of time. To delay this process, many different techniques are used to extend wood’s working life, such as - painting, painting, staining or impregnation.

Another way to protect wood, in order to prolong its working life, is the use of WPC (Wood Plastic Composite). Carbon composite is primarily made of high density polyethylene, recovered from waste streams (milk containers, plastics) and wood waste [3]. Composite wood have been used in the world since the 70's, while in Poland – has been available on the market for a few years only. WPC is a material, which has not only aesthetic appearance (looks like natural wood), but having the typical plastics features. WPC is primarily used for the production of timber decking.

The main advantages of WPC are: the fact that it is not susceptible to decay, caused by weather conditions or climate, does not warp (it's waterproof), does not break under the influence of temperature or external factors. It also causes that its life is considerably longer than in the case of natural wood. WPC has characteristics similar to natural wood - can take any form, is susceptible to cutting, drilling or milling, and also looks like natural wood. This product does not require any maintenance - painting, cleaning or painting, and in addition, the touch is like a wood - is warm and has a high stiffness (not deformed), is covered with a non-slip layer and has no splinters.[4][5][6][7]

However, except the advantages, WPC has some disadvantages as well, such as: biodeterioration - it is susceptible to fungus and mildew influence, which can lead to the formation of unsightly spots on the surface, and leads to the decomposition of the composite, moisture cycling – the research [8] shows that the composite, somewhat can absorb humidity, which leads to the swelling and contraction, and in result causes surface cracking. UV degradation – WPC’s exposure to UV radiation may also adversely affect the quality of the

surface and reduce its rigidity. It was also found that UV radiation can alter the structure of the composite [9], cause fading [10] or discoloration [11].

However, the main argument, expressed by WPC supporters, is the argument concerning the environment - due to the fact that WPC is made of plastic, which is recovered from the waste stream. But, this is the main and also the only argument for WPC from an environmental point of view. But, this issue is highly controversial because until today there has been no research conducted, which has taken into account all aspects (such as the impact of the manufacturing process or management of the used product). And some opinions undermining that WPC is an environmentally friendly, can be found, such as:

- In most cases, the WPC has been produced from plastic waste originating from a milk or juice containers. However, in some cases, a WPC might be produced from polyvinyl chloride – which, according to Greenpeace’s opinion, is one of the most harmful plastics – it is carcinogenic, has a negative influence on the human immune system and its manufacturing process caused many tons of greenhouse gas [12],
- The level of energy used for WPC production is much higher than in the case of pure timber manufacturing [12],
- In addition, WPC is non-recyclable, which can lead to an increase in plastic production, and also can cause that the level of waste deposited in landfills will be increased as well [12],
- Further results of LCA and LCI analysis, which are the essence of research conducted by FPInnovations Forintek Division in 2009, show that the WPC has many of the same limitations as natural wood (previously mentioned disadvantages), plus WPC has a much bigger impact on the environment than natural wood. The research has found that, for each measured factor (Global Warming Potential, Potential acidification, Resp. Effects, Eutrophication, Smog, Total Energy Used, Fossil Energy), a WPC has a much greater impact than natural wood. Also in the case of measuring factors such as: Critical Air Pollutants, Ecological Toxicity, Fossil Fuel Depletion, Habitat Alteration, Human health, Indoor Air and Water Intake, WPC was characterized by a greater influence than natural wood.

To sum up, it cannot be concluded for 100%, that the WPC is an environmentally friendly product. Looking from the side of its production, the big advantage is the use of waste to produce it, but given the overall picture, it can be assumed that in the future, WPC would become a waste - not subjected to recycling, not biodegradable, and increasing the volume of waste stored in landfills. Unfortunately, due to the fact that WPC is a quite new product, recently used in Poland, it is difficult to determine its actual impact on the natural environment and its future in the form of waste.

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**Streszczenie:** *Współczesne metody zabezpieczeń drewna a zagrożenia dla człowieka i środowiska.* Drewno jest surowcem bardzo szeroko wykorzystywanym przez użytkowników indywidualnych. Jest ono stosowane do produkcji mebli, elementów dekoracyjnych czy też podłóg lub tarasów. Szczególnie w przypadku podłóg tarasowych, drewno wykorzystywane do ich produkcji musi charakteryzować się wysoką odpornością nie tylko na warunki atmosferyczne ale także na codzienne użytkowanie. To powoduje, że oprócz tradycyjnych metod zabezpieczenia i konserwacji drewna, do produkcji podłóg tarasowych, zaczęto wykorzystywać drewno kompozytowe (WPC – Wood Plastic Composite). Niniejszy artykuł przedstawia charakterystykę drewna kompozytowego, wyszczególnia jego główne zalety, ale także wyróżnia cechy które świadczą że produkt ten nie jest do końca przyjazny środowisku naturalnemu.

Corresponding author:

Janusz Grabara,  
Al. Armii Krajowej 19b,  
42-201 Częstochowa, Polska  
email: janusz@grabara.eu  
phone: +48 34 3250-388