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RESEARCH AND APPLICATION OF WOOD-CONCRETE IN WORLD PRACTICE: AN OVERVIEW

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Wood-concrete products are used for the construction of exterior walls and partitions, as well as heat and sound insulation material in buildings for various purposes. They were spread in such countries as Austria, Australia, Belarus, Brazil, Canada, China, Great Britain, Germany, Holland, India, Japan, Switzerland, Russia, USA, France, etc. Wood concrete products have high strength, low thermal conductivity, high heat capacity, are not subject to rotting, fungal and microorganism damage, and are environmentally friendly. In Polotsk State University (Belarus), a new generation of wood-concrete has been developed. The technology will make it possible to obtain a material with directional filler placement and desired properties. Arbel modifier additive allows to reduce the operating humidity and thermal conductivity of the material. The method of selection of additives allows you to quickly select the composition of the additive and wood-concrete.

Keywords: *wood-concrete, international, world practice, overview, desired properties, energy efficiency.*

Introduction. Wood-concrete products are used for the construction of exterior walls and partitions, as well as heat and sound insulation material in buildings for various purposes. They were spread in such countries as Austria, Australia, Belarus, Brazil, Canada, China, Great Britain, Germany, Holland, India, Japan, Switzerland, Russia, USA, France, etc. Wood concrete products have high strength, low thermal conductivity, high heat capacity, are not subject to rotting, fungal and microorganism damage, and are environmentally friendly.

We present the main consumer characteristics and advantages of wood-concrete products. In relation to wood: wood-concrete is not subject to rotting, defeat by fungi and microorganisms, does not burn, has improved air exchange and humidity regulation in the room. In relation to gas silicate, foam concrete blocks, bricks, heavy concrete: concrete can be easily machined (sawing, drilling, cutting), reliably holds fasteners, has high sound absorption, has an increased crack resistance when the maximum permissible loads are exceeded, which allows to transfer sediments without damage building. Minimum use of lifting equipment in the implementation of construction using the intended products due to the unique physical characteristics.

Scientific research in this area was carried out in many countries of the world. The main directions of these studies are as follows: the development of wood-filling mineralizers, the development of wood-concrete mixture modifiers, the development and optimization of methods for compacting the mixture, the development of methods for influencing the material at the hardening stage.

Main part. The article provides an overview of the study and use of wood-concrete in different countries of the world. Since there are a lot of studies in the field of wood concrete, only a few of them are presented in the overview.

In America, the study of wood-concrete devoted to the work of the following authors: R. Gutkowski, M.R. LeBorgne, J.T. Kevern, B. Koohestani, E.Y.A. Okino, A. Quiroga, et al.

In Colorado State University (USA) the test results show that it is possible to achieve medium to high degrees of composite action in layered solid wood–concrete beam specimens using nominal dimension lumber and a notched shear key/anchor detail [1]. Wood–concrete composite beams are an efficient way to construct and renovate floors that require a high stiffness and load carrying capacity [2].

In the article [3] presents the results of a testing plan designed to evaluate the effects of macro synthetic fibers on pervious concrete material properties and durability.

In Canada fulfilled experimental study investigates the influence of maple-wood sawdust addition on the mechanical and microstructural properties of cemented paste backfill [4].

Six eucalypts species and two clones of rubberwood, planted in Brazil, were used to manufacture wood cement-bonded particleboard. The hydration test has shown that all six mixtures of species were compatible with Portland cement. The mixtures investigated were classified as being of ‘‘moderate inhibition’’, even without addition of chemical additive. Calcium Chloride enhanced the performance of the mixtures, which grades were classified as being of "low inhibition" [5].

In Argentina studies water extraction, alkaline hydrolysis and coating of the wood surface are convenient technological strategies to avoid setting inhibition phenomena [6].

In Asia, the study of wood-concrete devoted to the work of the following authors: Ch. Ruilin, Z. Jiamin, P.M. Katkar, C.A. Patil, P.A. Khude et al.

At Huaqiao University (China) bamboo fibers were extracted using mosso bamboo as raw material for concrete thereby making bamboo fiber concrete. In the concrete preparation process, after sand, stone and cement were uniformly mixed, bamboo fiber was added to the mixture together with water to obtain a bamboo fiber concrete mix. Through axial

compressive and tensile strength experimental analysis, the mechanical properties of bamboo fiber concrete were reduced in comparison with ordinary concrete, but the ductility and toughness of the concrete were significantly improved. Overall, the addition of bamboo fibers resulted in a significant improvement in the overall performance of the concrete, and it is believed that the concrete strength problem could be solved if a higher strength outer layer of bamboo fibers was used after special treatment (Y. Ni, 1995)[1].

In India, the DKTEs Institute of Textiles and Engineering studied the feasibility of coconut shell fiber reinforced cement boards for civil engineering projects. The experiments were carried out on coconut shell fiber reinforced cement boards, unboiled coconut shell fiber non-textile reinforced concrete boards and boiled coconut shell fiber non-textile reinforced concrete boards and the three different boards were compared for thermal conductivity, flexural and compressive strength and water absorption. The experimental results show that the performance of the boiled coconut shell fiber non-textile reinforced concrete slabs is optimal, with lower thermal conductivity, moderate water absorption and higher compressive and tensile strengths [7].

In Australia and Japan, natural plant fibers (mainly wood fibers) and concrete blending research has been vigorously carried out since the mid-1990s, and many patented results have been obtained [8].

In Africa, the study of wood-concrete devoted to the work of the following authors: Z. Kammoun, D. Taoukil, A. O. Olorunnisola, M. S. Mungwa, M. Bederina et al.

In Tunisia, found that concrete with cactus fibers led to a reduction in thermal conductivity, but with the addition of cactus fibers, the thermal conductivity and compressive strength of the material decreased [9].

In Algeria, found that concrete with wood fibers increased its mechanical strength and had good mechanical properties [10].

In Cameroon, found that wood-concrete structures have higher stiffness, ductility and ultimate strength than concrete-steel structures [11].

In Nigeria, researchers have focused on the effect of wood particles on the properties of concrete, finding that the smaller the particle size, the stronger the material produced [12].

In Morocco, researchers have worked on the water absorption of wood-concrete at various wood contents, and studies have shown that wood-concrete has a high-water absorption capacity [13].

In Europe, the study of wood-concrete devoted to the work of the following authors: B. Kasal, M. Khorami, T. Salem, C. Lacoste, N. Subbotina et al.

Researchers at Germany found that concrete incorporated with wood fibers had low water permeability, frost resistance and high durability. And the longer the length of the fibers, the more pronounced the effect [14].

In the UK, researchers found that agricultural wood fiber waste from bagasse, wheat and eucalyptus increased the compressive strength of concrete [15].

In France scientists found that using maple fibers to add to concrete did not negatively affect it, but rather increased its strength and durability [16]. Researchers there worked on the feasibility of wood-concrete with alginate as a binder. The results of the study showed that this approach was feasible and increased the compressive strength of the new material [17].

In Russia, some researchers found that using phosphate as a buffer improved the strength and reduced the water absorption of the new material [18].

In Antarctica, in February 1962, the USSR began construction of the "Molodezhnaya" International Station in Antarctica for scientific research. At that time, widely produced wood concrete panels were chosen as the material for the wall bodies. By 1967, 3 residential buildings and a canteen building made of wood concrete with a thickness of only 30 cm were built[2].

Conclusion. The Republic of Belarus, as part of the world scientific community, is also engaged in scientific research in the field of wood-concrete. In Polotsk State University, a new generation of wood-concrete has been developed [19]. The technology will make it possible to obtain a material with directional filler placement and desired properties [20]. Arbel modifier additive allows to reduce the operating humidity and thermal conductivity of the material [21]. The method of selection of additives allows you to quickly select the composition of the additive and wood concrete [22].

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ИССЛЕДОВАНИЯ И ПРИМЕНЕНИЕ ДЕРЕВОБЕТОНА В МИРОВОЙ ПРАКТИКЕ: ОБЗОР

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Изделия из деревобетона используются для возведения наружных стен и перегородок, а также в качестве тепло- и звукоизоляционного материала в зданиях различного назначения. Они получили распространение в таких странах, как Австрия, Австралия, Беларусь, Бразилия, Канада, Китай, Великобритания, Германия, Голландия, Индия, Япония, Швейцария, Россия, США, Франция и др. Изделия из деревобетона обладают высокой прочностью, низкой теплопроводностью, высокой теплоемкостью, не подвержены гниению, поражению грибками и микроорганизмами, экологически чистые. В Полоцком государственном университете (Беларусь) было разработано новое поколение деревобетона. Технология позволяет получать материал с направленным расположением заполнителя и заданными свойствами. Добавка-модификатор Арбел позволяет снизить эксплуатационную влажность и теплопроводность материала. Методика подбора добавок позволяет быстро подобрать состав добавки и деревобетона.

Ключевые слова: *деревобетон, международный, мировая практика, обзор, заданные свойства, энергетическая эффективность.*