UDC 674,047

ANALYSIS TECHNOLOGY THERMAL MODIFICATION OF WOOD

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The analysis technology of Thermomodified wood. Shows its advantages over conventional wood.

Wood thermal modification technology

Problem. Wood has always been one of the the most common building materials. It is available shvydkovidnovlyuvalnyy, lightweight and easy to cutting material. First round materials used small diameter, but eventually timber in the form of boards and beams ousted round wood due to its practicality.

For centuries, the wood used in construction to create the foundations, exterior and interior walls, flooring, structural engineering, windows, doors, furniture and more. However, in recent decades there have been significant changes in the market of building materials, of which the wood loses its interest not withstanding competition of alternative non-wood and wood-composite materials.

In construction mainly coniferous wood, and in the manufacture of furniture - hardwood. Already registered deficit last as they are updated 7-10 times slower than low-value soft rock and, consequently, increases their cost. In order to improve the physical and mechanical properties of softwood developed a new technology modification of wood in special chambers under certain temperature conditions. Outside the treated wood is virtually identical to valuable species, besides increased hardness, water resistance, chemical and biological stability. New technology has to receive a fundamentally new type of composite material - thermally modified wood [1].

The purpose of research- Analyze existing technologies for thermal modification of wood.

Results. Research and optimization of thermal modification of wood happening in different countries for a long time. Yes, Alfred J.Stamm first tried in 1946 to increase the resistance of wood to the tree destroying fungi

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the processing of hot metal in solution [2]. Buro (1954-1955rr.) Studied heat treatment of wood in different gas environments. Other features thermal modification of wood studied for a long time and interest mainly focused on the specifics of drying technologies (Schneider 1973.) changing the chemical structure of wood after treatment at high

temperatures (Sandermann and Augustin 1963; Kollmann and Fengel 1965; Topf 1971; Tjeerdsma 1998; DN lecturing, AA Berlin, V. Matveev); increasing the stability of geometric dimensions (Kollmann and Schneider 1963 PS Serhovskyy, LA Leparskyy, NY Solechnyk, BC Chudinov, Yu.M.Huber) and the strength of the material (Schneider 1971, Rusche 1973, and E . Fruhwald, S. Poncsak, E. Giebeler, Jun Li Shi). In 1973, Burmester discovered upgrade wood after thermal treatment under pressure. Then the process investigated Giebeler (1983.). V. Möttönen, M. Bäckström, T. Kärki studied warping thermally modified wood. MH Akyildiz and S. Ates examined the impact of high temperatures on some wood moisture content [3, 4, 5].

This was the basis for the studies conducted in Finland, France, Italy, the Netherlands, Russia. The feature of the Finnish Thermowood technology is that thermal modification is carried out in a protective environment of water vapor at temperatures of 185-212 ° C. Plato Dutch technology based on cyclic thermal hydrolysis of wood at temperatures of 160-190 ° C. French Retification technology provides thermal modification of wood at a temperature of 220-250 ° C in an environment unsaturated water vapor. German technology is based on a timber of liquid organic compounds with four temperature conditions. As a protective environment using vegetable oils (linseed, sunflower, rapeseed). Technology firms Vacuum Plus provides wood in vacuum at 160-210ºS. The basis of Russian technology firm BIKOS-TMT is a timber with overpressure in the protective environment of steam at temperatures of 180-220 ° C [6].

Despite the variety of temperature and environmental conditions essence of technology is based on three steps - drying, cooling and heat-treated [7]. Drying - the longest stage of heat treatment of wood - with steam heat and temperature in the chamber rises to 130ºS and moisture in the wood close to zero. During heat treatment - temperature inside rises to 180-240 ° C, in an environment almost saturated steam, which prevents burning wood and affect change in its chemical properties; duration of this phase of 2-3 hours. During cooling - the temperature decreases to 80-90 ° C, humidified wood again to reach the final moisture level of 4-7%; duration of this phase depends on temperature processing, wood grade and takes 5-15 hours.

As a result, found that when exposed to wood temperature 180-250 ° C and certain environmental conditions created a new high-tech product - thermally modified wood - TMD (Thermally Modified Timber).

It is a natural, environmentally friendly material that has a number of unique properties compared to conventional wood or construction [8]. Thus, thermal wood reduces the equilibrium moisture content of 40-50% compared to untreated Thermal and it is W = 3-5%; observed in 15-25

times increase biological durability due to the decomposition hemicellulose at high temperatures without introducing chemical protective substances. Due to its length depolymerization of cellulose chains decreases as indicators TMD resistance to temperature and humidity increases by 10-15 times. So it does not dries and does not swell.

Exposure to high temperatures leads to changes in the structure of wood, accompanied uniform across the cross-section of color change, thus achieving the effect of rocks. So you can get any shades from light yellow to black. It is known that water absorption TMD 3-5 times less thermal conductivity and also lower by 20-25% compared with untreated timber. Thermal treatment decreases tar in coniferous wood; partially increases elasticity, firmness fire wood.

The properties affected by temperature treatment of TMD. In the Table. 1 shows the characteristics and scope of Thermal.

1. Characteristics and scope Thermal *[6].*

Changes properties of wood after termomodyfikatsiyi	Hardwood		Softwood	
	Temperature modification, ° C			
	185-200	200-220	190-200	212-230
1	2	3	4	5
Resistance to change the parameters of the environment	+	+	+	+
Biostiykist	++	++	++	++
Reduction of thermal conductivity	+	++	+	++
Improved stability geometrical dimensions	+	+	+	++

End Table. 1

1	2	3	4	5
Reduced equilibrium moisture	+	++	+	++
Weight reduction	+	++	+	++
Shaded	+	++	+	++
Flexural strength	unchanged	-	unchanged	-
Applications	Internal equipment prymischen Vyhotovlennya longer-room and garden furniture, flooring rooms and baths, laminated boards	Internal and external equipment of premises saunVyhotovlennya indoor and outdoor furniture, flooring rooms and baths, laminated boards	Interior equipment prymischenVyhotovlennya construction materials, indoor and outdoor furniture, flooring, windows and doors, laminated boards	External equipment rooms, saunas and bathroom kimnatVyhotovlennya terraces, piers, garden and park structures, exterior windows

			and doors, flooring, furniture

Significant increase ++, + increase, - decrease

In accordance with the European standard EN 335-1-2006 [9], which regulates the strength of wood and its products can be divided into three classes Thermal (tab. 2).

2. Characteristics of Thermal classes.

Indicator	Thermal Classes		
	1	2	3
Processing temperature, ° C	190	210	230
Change the properties of wood	Unchanged	Increase of material to decay, reducing the elasticity of wood	High rates of resistance to decay
Applications	A similar untreated wood	From lumber to small architectural forms, windows, doors, furniture for garden and home	Production of windows and doors, exterior walls and the installation of street decks

It is seen that the higher the temperature wood, the lower density and strength will own material and increases its service life.

Thermowood Association classifies thermally treated wood only two classes - Thermo S (stability - stability) and Thermo D (durability - durability). In the Table. 3 properties compared to heat treated and untreated pine.

3. Comparative characteristics of physical and mechanical properties Thermomodified and untreated pine [10].

Characteristic	Thermo S to 185 0C	Thermo D 230 0C	Unprocessed pine
Density, kg / m3	540-560	510-530	470-540
Flexural strength, MPa	100-105	90-95	70-92
Modulus, MPa	14000-14500	13200-13500	8000-13000
Ball-hardness, MPa	1,6-1,65	1,65-1,7	1.6
Permeability (in EN 927-4)	5-7%	5-7%	24-28%
Thermal conductivity, W / mK	0,09-0,11	0,09-0,11	0,15-0,19

The strength of wood is closely related to its density. Heat treatment of wood reduces its density to 5.10% and, consequently, reduced strength ratios.

Among the tree species in Ukraine birch, aspen, basswood, poplar and other softwood species occupy 10%. Given the unattractive appearance of the possibility of such species as birch, aspen, basswood underestimated woodworkers. Traditionally, domestic consumers, these rocks are associated with plywood or wood. Thermal modification of wood species with undesirable texture improves their appearance and some physical and mechanical properties, thus extending the scope of these rocks.

Conclusions

1. The results of investigations of modified wood. Found that instead of the physical and mechanical properties of wood affect processing modes and conditions.

2. Scheme of wood modification process high temperatures based on three stages and all existing technologies differ only in temperature regimes. Having examined the basic technology heat treatment of wood should be noted that at different temperatures modifying properties of wood vary in different ways. Therefore, the choice of rational technology should target those properties that you want to achieve in the first place.

3. Thermal compared with untreated timber has better properties - high water absorbency, biological stability, flexibility, stability of geometrical dimensions, slightly higher hardness. In this way it is possible to extend the scope of m'yakolystyanyhyh wood species.

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Production technology Proanalyzyrovanы termomodyfytsyrovannoy timber. Pryvedenы ee Benefits before Standart drevesynoy.

Timber termycheskaya modyfykatsyya, TECHNOLOGY

Analysis the technology of thermal modification of wood are given. Presented its advantages over conventional wood.

Wood, thermal modification, technology

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COMPARATIVE ANALYSIS OF PLANT MATERIALS AND PROPERTIES OF RAPE stems And wheat-wheat straw

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The analysis component composition, structure and properties of plant material from the stems of rape, wheat-rye straw in terms of the prospects for their use in the manufacture of particle board and other materials derevynnokompozytsiynyh.

Derevynnokompozytsiyni materials, particle boards, herbs, chemical composition, structure, wheat-rye straw, stalks turnipsment.

Problem. Today in many countries for the manufacture of particle board and other materials derevynnokompozytsiynyh traditional raw wood was and is. The speed of global deforestation and its impact on the environment forcing manufacturers of these products to search for alternative sources of raw materials. This is typically lihnotselyulozna raw agricultural production, including straw. The average market price of straw is several times smaller than the timber. In the case of this material significantly reduced energy and financial costs to grinding and drying. In addition, it belongs to shvydkovidnovnyh raw materials. In recent years, many countries Cereal straw was the main nederevynnoyu raw material that was used for the manufacture of wood-based panels. Cereal straw find the most suitable agricultural product for the manufacture of wood composites.

One of the main factors that hinder the use of straw as a raw material for the production of wood-based panels, is the presence of wax with a rather complex chemical composition, which in no straw scattered throughout its mass, as is the case in the wood, and is almost entirely on