Water-soluble antiseptics are used for making wood moistureproof. Because of high inflammability and sharp odour, oil antiseptics are used only for impregnating or coating wood placed in the open air, soil or water. Antiseptic pastes are subdivided according to their binders into bitumen, silicate, etc., varieties.

Wood preservation with liquid compositions includes surface preservation, impregnation in hot-cold and high-temperature baths, impregnation under pressure.

Wood is very inflammable, this being one of its major shortcomings. Wood can be protected against fire by plastering, coating with gypsum or asbestos-cement sheets or surface treatment with fire resistant substances. There are two surface treatment techniques, namely, painting and impregnation with fire protection compounds, or antipyrines.

Materials, Items and Structures from Wood

Building logs from conifer and broad-leaved species should not be less than 14 m thick at the top and 4 to 6,5 m long. Logs are used for hydraulic engineering structures, bridge elements, power transmission and communication lines, railway tracks.

Sawn timber is obtained by longitudinal cutting of logs planks, sleepers. By finish, sawn timber falls into clean-cut variety in which both edges have been cut throughout their length and non-trimmed variety in which the edges are not cut or cut less than half their length. Sawn timber for glued items and structures (archs, beams, farms) should have a moisture content not more than 15%, and that for bridge span structures and other load-bearing constructions should carry not more than 25% moisture.

Factory plank used for various building applications include platbands, plinths, finished floor boards, handrails for barriers, treads, window-sill board and exterior sheathing of house.

Floor materials include piece parquet, parquet boards, finish flooring boards, wood chipboards, wood laminates and fiberboards.

Wood chipboards are sheet materials manufactured by hot-moulding of wood chips, impregnated with polymers. In the course of hot-moulding, chips are compacted, and the viscous polymers harden, to cement the filler into a monolithic material. Wood chipboards are made of wood of conifer and broad-leaved species. Resistance of wood chipboards to water biological agents and fire is enhanced by treating chips with antiseptics and antipyrens.

Wood fiberboards are sheet materials composed of organic fibrous fillers (wood, reed, hemp) polymer-bonded together by hot-moulding. Culled wood is first cut into chips, than into fibers. Fibrous pulp is diluted with water and pumped to a reservoir for mixing with a solution of phenol-formaldehyde polymer (4-5% of the dry mass weight), hydrophobic additives, antiseptics and antipyrens. Fibrous pulp is pumped from the reservoir to a long mesh moulding machine for dehydrating and moulding the pulp into a continuous sheet, which is passed to a machine where it is cut into boards. By their average density, wood-fiber boards are available in three kinds: semi-hard (not less than 400 kg/m^3), hard (not less than 850 kg/m^3) and extra-hard (not less than 950 kg/m^3). Soft boards are used for heat-insulating of walls and floors, semi-hard and hard boards are used for facing walls and the extra-hard ones, mostly for floors.

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ENERGY CONSUMPTION REDUCING IN THE ASPIRATION SYSTEMS AT THE WOODWORKING ENTERPRICES

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The article deals with traditional and modernized aspiration systems at woodworking enterprises. It presents some activities for aspiration systems technology improvement, which help to reduce energy consumption. It researches a volume vertical packaged collector application in the aspiration system; it

introduces graphical dependences of aerodynamic parameters and waste catching degrees during the modern aspiration system working. It contains the analysis of the results and recommends methods, which improve aspiration system working.

The woodworking enterprises produce a good deal of waste: wood chips, saw dust and dust. Wood wastes are removed from the room by bush aspiration systems, which contain waste and air receivers, duct pipelines, cyclones and ventilators.

The bush aspiration systems don't only serve for the moving of materials, they are also used as local retractable ventilation systems. It is a specific characteristic of bush aspiration systems. The pressure decreases in the system due to duct pipeline wall friction of transported materials and transported air, material particles surface friction of the air, that have less speed, and also friction of material particles. Shaped parts of the duct pipeline and the used equipment have increased resistance. There are energy expenses for overcoming the material weigh [1].

In view of aspiration systems features, we can offer to improve technology of these systems and significantly decrease the length of material transportation or energy consumption decreasing. That's why we offer to install volume vertical packaged collector [2] in the middle of the machines location, where large particles of the transported material precipitated. Cyclone is installed after the packaged collector. It clears only medium and small dispersion dust (fig. 1).

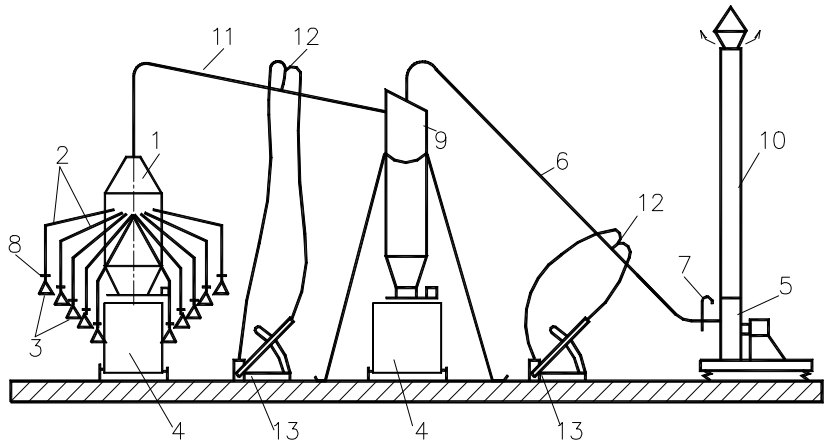

Fig. 1. Scheme of modernized bush aspiration system

1 – vertical packaged collector; 2 – duct pipelines; 3 – dust receptacle casing; 4 – truck; 5 – ventilator; 6 – packaged duct pipeline; 7 – damper; 8 – ventilation valve; 9 – cyclone;10 – exhaust pipe; 11 – packeged duct pipeline; 12 – pneumatic tubes; 13 – micromanometer

The most widely used at the enterprises are the bush aspiration systems. Every such system unites more than ten woodworking aggregates. In the middle of the aggregates location and their suctions *3* we offer to situate the vertical packaged collector *1* [2], which is appended in the top part of duct pipelines *2* from waste receivers. The waste receivers connect with machines. The main function of packaged collator is to drop out the basic weight of wood waste particles from the air flow. Such accumulation takes place due to fast decrease of the air speed at the collector, which has the biggest diameter (8-10 times) than the pipeline diameter from the waste receivers.

Wastes accumulate in the vertical collector under the own influence of weigh. Fallen wastes don't transpose and don't have cyclone purification *9*. It is a reason of energy consumption reducing on 15-20 %. The cyclone *9* and the ventilator *5* are situated at some distance of collector and it's usually situated outside. Waste removal from the collector is produced by the air outlet to body truck 4 or to conveyer.

Air quantity, which is drawn out by ventilator *5* on the packaged duct pipeline *6* according to the number of synchronous working machines, is controlled by ventilation valves *8*. These valves are mounted in pipelines *2* directly near the every machine suction *3*. All the currently inactive machines disconnect automatically of the aspiration's net, thanks to ventilator valves, which are electrically connected with machines. In result the ventilator *5* draws out less air quantity and therefore it consumes a reduced power, through the so-called, net throttling. However transporting speed is fast reduced in the packaged duct pipeline 6, when the small quantities of machines are synchronously working. It makes the purification efficiency of dust worse in the cyclone *9*.

That's why it is necessary to provide the installation of the speed reactor *9* at the air inlet in the cyclone. Speed reactor will maintain the air speed at the allowable level and it doesn't matter how many machines are synchronously working [3]. Wood dust, which was caught by cyclone, is periodically unloaded from the bunker in the truck *4* or to the conveyer.

The air speed on the net part can be less than transporting speed or more than terminal velocity, because only dust is transported in the duct pipeline and the mass concentration of aero mixture is negligible.

Transporting speeds and terminal velocities of wood dust can be determined from the formula [2]:

$$\upsilon_{mp} = c \cdot \left(4 \cdot \mu \cdot \frac{\upsilon_в}{\upsilon_м} + 0{,}01 \cdot \rho_м + b \right) \cdot \sqrt{\frac{1{,}2}{\rho_в}} =$$

$$= 1{,}1 \cdot \left(4 \cdot 0{,}02 \cdot 1{,}1 + 0{,}01 \cdot 500 + 7\right) \cdot \sqrt{\frac{1{,}2}{1{,}2}} = 13{,}2 \text{ m/sec}.$$

where c = 1, 1-the coefficient, which considers the speed decrease in the local consumptions; $\rho_м$ – the density of the material, kg/m^3; $\rho_в$ – the density of the air, kg/m^3; μ – the concentration of material, kg/kg; $\upsilon_в$ – the air speed, m/sec; $\upsilon_м$ – the material speed, m/sec; b – the experienced coefficient, which depends on the kind of the transporting material (for dust b = 7).

$$\upsilon_s = 0{,}14 \cdot \sqrt{\frac{\rho_м}{\left(0{,}02 + \frac{a}{h}\right) \cdot \rho_в}} = 0{,}14 \cdot \sqrt{\frac{500}{\left(0{,}02 + \frac{0{,}9}{3}\right) \cdot 1{,}2}} \approx 5 \text{ m/sec}$$

where a = 0,9- the coefficient, which depends on the shape of particle; h – particle thickness, mm.

According [4] the values of the dust transporting speeds belong to the interval:

$$m \cdot \upsilon_s < \upsilon_{mp} < n \cdot \upsilon_s$$

where $m \cdot \upsilon_s$ – the minimum value of the diphasic flow speed according to the kind of the transporting material, m/sec; $n \cdot \upsilon_s$ – the maximum value of the diphasic flow speed according to the economic conditions of the aspiration systems operation, m/sec.

The minimum value of the dust transporting speed is 9...10, 5 m/sec for the experimentally received meanings m = 1, 8, n = 2, 1. Satisfactory air speed by dust outlet will be about 6 m/sec in the duct pipeline. This air speed is scarce for the cyclone work, so it is necessary to install a speed reactor in the cyclone inlet.

Experiments were conducted with changing air consumption from 120 to 180 m^3/h. The aero mixture concentration was accepted within 0, 1…0, 5 kg/m^3. Results of the experiments are presented in the form of graphs (Fig. 3, 4).

Based on the graphic dependences in Fig. 3, 4, we can make the following conclusions:

– aerodynamic characteristic and, therefore, the consumption of the packaged duct collector net with 10 modes constitute insignificant part of all installation consumption;

– disconnection of temporary inactive machines from the aspiration net significantly reduces energy consumption for material transportation, although net consumption is increasing due to decrease of the air consumption. If you accept the coefficient of the synchronous working machines as 0, 6, that power consumption of energy consumption will reduce on 21, 2% in the experiment;

– the main wood waste mass (86-90%) falls in the vertical collector, thus it isn't necessary to transport it by expensive pneumatic methods, which need large energy consumption. There is a tendency to some insignificant decreasing of the accumulated waste mass with the increasing of synchronous working suctions. It can be explained by the difference between modes of the waste entrance in the collector shell. It is necessary to connect air channel of the suction to the collector shell, which is leaned angle 40 – 50º;

– the additional economy of energy consumption is about 40%, what is achieved by the main mass of large wood waste transfer induct pipelines on the short distance from machines to the packaged collector. It is helping to reduce pressure loss;

– only 8 – 13% of small factions of all waste mass gets in the cyclone, besides, the load slightly increases in the cyclone with the increase of the synchronous working machines quantity, although, the purification degree stays on the constantly high level (93 – 97%). It can be explained by the presence of speed reactor and small mass of the fine-dispersed dust ejected in the atmosphere.

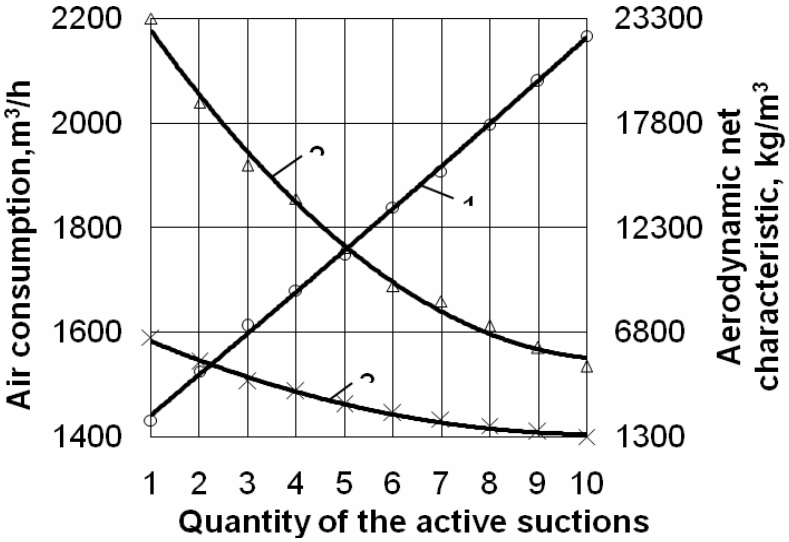

Fig. 2. Aerodynamic parameters of the aspiration system:
1 – air consumption; 2 – aerodynamic characteristic of the aspiration system;
3 – aerodynamic characteristic of the packaged collector net

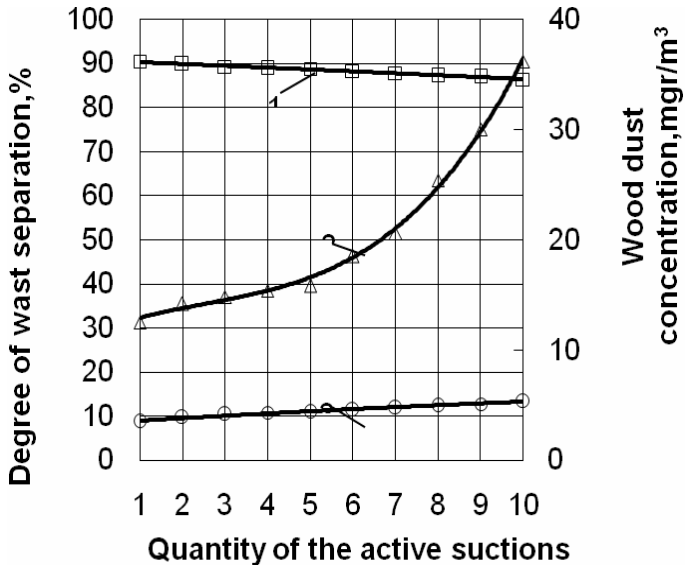

Fig. 3. The degree of waste separation with the improved aspiration system:
1 – waste quantity, which was separated in the packaged collector; 2 – dust concentration in the air ejections;
3 – waste quantity, which was separated by cyclone

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