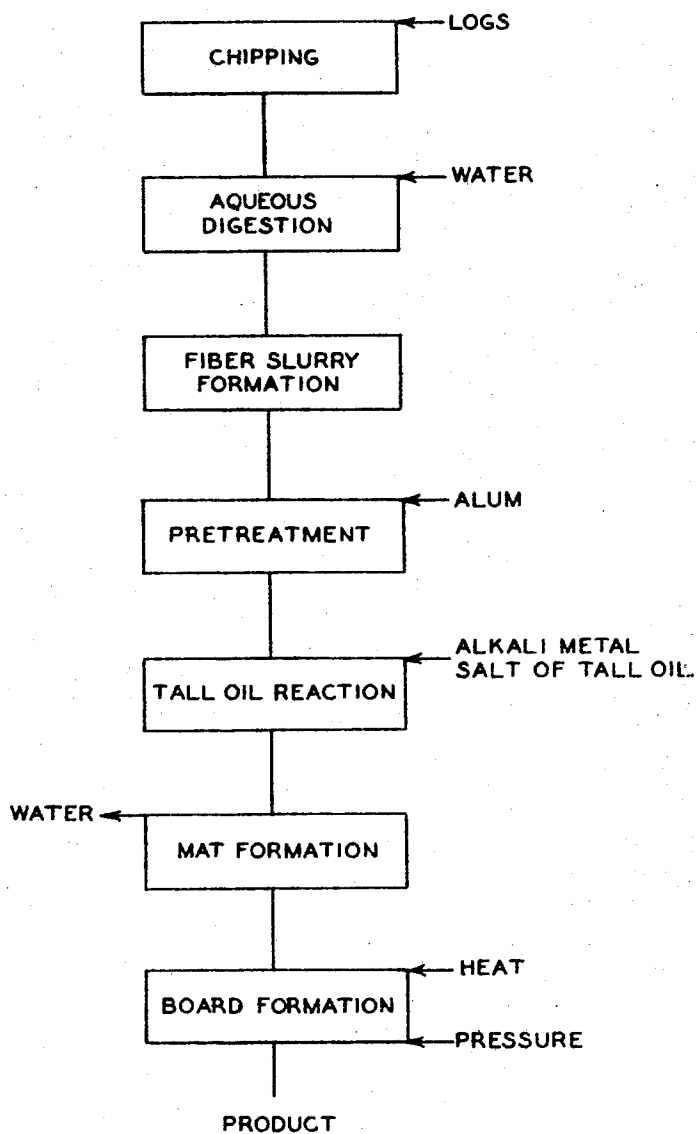


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PROCESS OF FORMING MOISTURE RESISTANT
HARDBOARD CONTAINING TALL OIL
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PROCESS OF FORMING MOISTURE RESISTANT HARDBOARD CONTAINING TALL OIL

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6 Claims

ABSTRACT OF THE DISCLOSURE

A process, and product, of improving the water resistance of wood fiber hardboard. To a slurry of wood fibers is added alum to pretreat the fibers. There is then added to the alum-treated slurry an additive consisting essentially of the water-soluble, alkali metal salts of tall oil. The hardboard is then formed in the usual manner.

This invention relates generally to fiberboard and more particularly to a wood fiber hardboard. Still more particularly, the invention relates to a process of imparting moisture resistance to a pressure consolidated wood fiber hardboard.

The making of a hardboard normally involves reducing wood logs or billets to chips. The chips are then subjected to a treatment with steam at pressure in the range of 90 to 175 pounds per square inch. The time of treatment normally runs 1 to 10 minutes. After the steam treatment, the chips are reduced to fibers by attrition processes such as disk refiners followed by further mechanical refining as in a beater, Jordan engine or the like. Alternatively, increasingly high steam pressures up to 1200 p.s.i. on the chips may be used, followed by quick depressurization to disintegrate the chips. The fibers are formed into a slurry of suitable consistency and the slurry is passed to a drainage wire or form in order to produce a wet mat. The wet mat is partially dried and is subsequently consolidated under heat and pressure to form an excellent hardboard.

The resulting hardboard, while possessing many excellent properties, has in the past suffered from water take-up. These hardboards will absorb water which reduces the strength of the board, and more important, causes appreciable dimensional change in the board. The attendant swelling and shrinkage causes destruction of the boards at their edges and also allows them to work loose. Accordingly, there is a need for an inexpensive but effective process of rendering these hardboards more resistant to water absorption.

It is a primary object of the present invention to supply this need. It is a further object of the present invention to supply a process of making a hardboard which will have enhanced water resistance and which at the same time will possess increased strength and reduced linear expansion on water take-up.

These objects are achieved in a strikingly effective and straight-forward manner. The invention contemplates imparting water resistance to hardboard by adding alum to the slurry of the wood fibers prior to mat formation. There is then added to the alum-treated slurry the water-soluble, alkali metal salt of tall oil.

The accompanying drawing is a simplified flow diagram of the process of the present invention.

The addition of alum to the wood fiber slurry is necessary to bring about the reaction of the subsequently added tall oil salts with the wood fibers. The alum will preferably be added in the form of a water solution of papermakers' alum. The amount of alum to be added will be in the range of about 1% to 5% by dry weight paper-

makers' alum based on the dry weight of the wood fibers. The alum solution will be added with stirring, and once the alum solution has been thoroughly distributed throughout the wood fiber slurry, the tall oil salts may be added.

The salts of tall oil are readily made by reacting a solution of alkali metal hydroxide with the tall oil. The solution of sodium hydroxide or potassium hydroxide may have a concentration in the range of about 3% to 10% by weight. Tall oil is simply added to the water solution of the alkali metal hydroxide with stirring. The mixture may be heated to enhance the reaction. The resulting water solution of tall oil alkali metal salts may be added directly to the alum-treated fiber slurry. The amount of tall oil to be added will be in the range of about 1% to 10% tall oil itself based on the dry weight of the wood fibers. Increased water resistance is obtained at the upper end of this range, although the resulting hardboard may have a density higher than that normally desired. A preferred range of amount of the tall oil is about 3% to 6% by weight tall oil based on the dry weight of the wood fibers.

The water solution of tall oil salt is simply added to the alum-treated slurry with stirring. After the tall oil solution has been thoroughly distributed throughout the slurry, it will be found that the tall oil salts have all reacted with the wood fibers. The resulting tall-oil-reacted wood fibers may then be used to form hardboard in accordance with the known methods. The mat will be formed generally in the range of thickness of 1 to 2 inches by passing the slurry to moving screens or molds. The mat will normally be partially dried after draining to reduce the water content further. One usable drying cycle involves drying the mat to a constant weight at 200° F. before pressing. Higher temperatures can be used for shorter times. The mat before pressing will generally have a moisture content in the range of about 3% to 8% by weight.

The partially dried mat will then be pressed at elevated temperatures. The pressures to be used will be in the range of 800 to 1500 pounds per square inch and the temperatures will be in the range of 300° F. to 500° F., with 400° F. being a good workable average. The higher temperatures are preferred. Although it is preferred that the hardboard be pressed in fixed bed presses, a succession of high temperature rollers may be used.

The resulting hardboard, having normal thicknesses in the range of 0.22 to 0.27 inch, will be found to have substantially improved water resistance as compared to hardboard which has not had the tall oil treatment. As an additional advantage, the tall-oil-reacted hardboards have an improved modulus of rupture.

The following examples illustrate several embodiments of the invention. All parts are by weight unless otherwise stated.

EXAMPLE 1

A solution of tall oil was prepared by mixing 795 parts water, 25 parts KOH, and 100 parts tall oil. The resulting solution of tall oil salts was used as described below.

A slurry was prepared of 1% consistency containing 577 parts steam cooked refined aspen wood pulp. With stirring, there was added to this slurry 145 parts 10% papermakers' alum solution. After distribution of the alum solution throughout the slurry, there was then added 160 parts of the tall oil solution prepared as described above. Agitation continued.

The slurry was then drained and pressed into a mat measuring 1 inch in thickness. The mat was dried in an air-circulating oven maintained at 200° F. to a constant weight. It was then hot pressed for 15 minutes at 400° F. and a pressure of 1250 p.s.i. After pressing, the board

was put in an oven at 300° F. and aged for 5 hours at that temperature.

The board, containing 3% by weight tall oil, had the following properties: density, 62.4 pounds per cubic foot; modulus of rupture, 7415 pounds per square inch; linear expansion, 0.13%; water absorption, 8.9%, by change of weight.

In contrast, a board prepared in the same manner but without the tall oil had a linear expansion of 0.23% and a water absorption of 15.9% by change of weight.

EXAMPLE 2

Boards were made as in Example 1, but containing different amounts of tall oil. Following are the results:

	2% tall oil	6% tall oil
Modulus of rupture, p.s.i.	7,175	8,625
Linear expansion, percent	0.15	0.16
Water absorption, percent	11.2	8.6
Density, pounds per cubic foot	61.7	60.1

I claim:

1. In the process of making a wood fiber hardboard by reducing wood to chips, subjecting the chips to an aqueous digestion, forming fibers from the resulting chips, forming said fibers into an aqueous slurry, and forming a hardboard from the slurry, the improved process of imparting water resistance to said hardboard comprising adding alum to said slurry, and adding to said alum-

treated slurry an additive consisting essentially of the water-soluble, alkali metal salts of tall oil.

2. The process according to claim 1 wherein said alkali metal is potassium.

3. The process according to claim 1 containing 1% to 10% by weight tall oil.

4. The process according to claim 3 wherein 3% to 6% tall oil is used.

5. The process according to claim 1 wherein said alum is added to said slurry in the form of a water solution.

6. The product of claim 1.

References Cited

UNITED STATES PATENTS

2,143,831	1/1939	Ellis et al.	162—225 X
2,215,244	9/1940	Linzell	162—179
3,009,820	11/1961	Gould	
3,022,327	2/1962	Waythomas	
3,306,812	2/1967	Sinclair et al.	162—225 X

FOREIGN PATENTS

842,820	7/1960	Great Britian.
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S. LEON BASHORE, Primary Examiner

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