

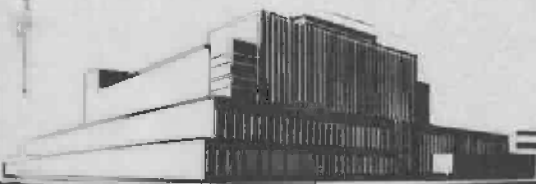
EXCELSIOR MANUFACTURE

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FOREST PRODUCTS LABORATORY
MADISON 5, WISCONSIN

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

In Cooperation with the University of Wisconsin

EXCELSIOR MANUFACTURE¹

By

Forest Products Laboratory,² Forest Service
U. S. Department of Agriculture

Excelsior consists of thin, narrow, ribbon-like strands of wood. In this country the product has no other general name, but in most other countries all grades of excelsior are known as wood wool. In the United States the name wood wool is reserved for only a small proportion of the output consisting of certain special grades of extra thin and narrow stock.

The property of greatest importance in excelsior is resilience; that is, ability of the material to expand readily after compression. It is this property that enables excelsior to fill space when used as packing and to provide the cushioning in upholstery, mattresses, and similar items. Wood used for excelsior is usually light in weight and color, soft, tough, straight-grained, absorbent, and free from odor. For certain uses, slight odor is not objectionable, and excelsior having some resin is readily accepted in the trade.

The principal use for excelsior is as a packing material for a wide variety of items to prevent breakage and marring. Much is consumed by the furniture and allied industries as loose excelsior and excelsior pads. Large amounts are also used to pack glassware, glass food containers, earthenware, and similar fragile articles.

Excelsior is used in low-priced upholstery and mattresses. To a certain extent it is used for insulation in cooling systems, as filtering material, animal bedding, and toy stuffing. Lightweight building boards, usually 2 or more inches thick, are made by bonding coarse excelsior with cement or magnesite.

An important use for excelsior in the West is in the packing of fruit, chiefly melons and grapes.

¹Original report dated May 1948.

²Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

At one time or another excelsior has been made from most native woods except the hardest and most pitchy species. The bulk of commercial excelsior, however, has always been produced from cottonwood, aspen, southern yellow pine, and basswood. In recent years cottonwood and aspen have accounted for about 50 percent of the total production, southern yellow pine 40 percent, basswood 8 percent, and other woods 2 percent.

Wood for excelsior manufacture must be available in substantial and steady supply at all times. The transportable limit for excelsior wood, because of costs, is about 50 to 100 miles. Bolts are usually cut 37 or 56 inches long, and must be free from gross defects and reasonably straight-grained. They are peeled by hand or machine, usually at the time of cutting, and stacked at roadside points to dry for 3 to 6 months before being transported to a plant where they are stacked in the yard or stored under cover to complete the drying. A shed may contain 3,000 to 5,000 cords or more, progressively ready for use. The wood is not allowed to dry longer than 2 years, to avoid decay, which renders it worthless for excelsior use. Well-seasoned bolts are trimmed and cut to the proper lengths for excelsior making. The following are specifications of an excelsior plant that buys 60-inch bolts:

"Wood to be sawed 5 feet long, peeled clean of bark; sticks to be straight, sound, free from large knots, and not less than 4 inches at the small end. Pieces 4 inches to 7 inches not to be split; bolts 7 inches to 11 inches to be split once; from 11 inches to 14 inches quartered; and over 14 inches split in proportion. All wood to be closely corded 4 feet 8 inches high, 8 feet long, and 5 feet wide."

Prices reported in 1948 for aspen and basswood rough bolts at Lake States plants were \$10 to \$15 per cord of 4 by 8 feet by 50 inches.

The typical excelsior machine is relatively simple in construction. A number of small parallel knives mounted in a heavy frame score the face of the bolt to the ribbon widths desired, and a slicing knife shaves the surface to the depth of the scoring, thus producing the individual strands of excelsior.

Excelsior machines are of two types: horizontal and upright. In the upright type the scoring knives move up and down; in the horizontal machines the knives move back and forth. In both types the bolt is held firmly between two rollers that automatically feed it into the knives. The upright machine is made in single units or in batteries of two or four machines. Horizontal equipment is usually installed in units of four or more machines.

It is reported that there is little difference in production volume with identical units of the two types. The average excelsior machine will cut from 800 to 1,200 pounds of excelsior in an 8-hour day. A cord of dry wood will yield 1,800 to 2,000 pounds of excelsior, varying with the dimensions and quality of the bolts, the grade of the product, and the kind of wood. The waste in manufacture is approximately one-fourth of the original wood volume. Much of the waste is used at the plant, chiefly for fuel or for blocks used in baling.

Excelsior must be carried away from the machines as made to prevent clogging. Three methods of conveying are commonly employed: endless belts that carry the stock directly to the baler; blowers; and hand tools, usually pitchforks.

The following are manufacturers of excelsior machinery: Crescent Excelsior Machinery Co., Indianapolis, Ind.; Lewis T. Kline Co., Alpena, Mich., and Mitts and Merrill, Saginaw, Mich.

The cost of excelsior machinery is relatively low. The prewar cost of a 20-machine plant turning out about 12 tons of excelsior daily was about \$10,000. Single upright machines then cost from \$150 to \$200 installed. Conveyors, trim saws, balers, and other simple equipment are required, besides the excelsior machines, for excelsior manufacture. Current costs, of course, are much higher than those indicated.

Excelsior is graded according to the thickness and width of the strands and the kind and color of the wood. Standard excelsior is 18 inches long or the length of the stick, 0.01 inch thick, and is divided into width classes as follows: fine, 1/26 inch wide; medium, 1/8 inch wide; and coarse, 7/32 inch wide. Certain special grades of excelsior, classified as "wood wool," vary in dimensions according to particular specifications, but are usually 0.005 inch thick and 1/32 inch wide. Wood wool is made as thin as 0.002 inch and as narrow as 1/64 inch. Material of this type is manufactured only for special purposes. Coarse excelsior runs from 0.012 inch to 0.02 inch in thickness and from 1/32 to 1/4 inch wide. Probably 80 to 90 percent of the output of excelsior is of the standard and coarse grades. These dimensions apply to the bulk of excelsior production. There are undoubtedly other sizes of product included in each of the three broad types or grades of excelsior. It can be manufactured quite readily to specifications for special uses.

Excelsior is sold by the ton. It is packed in bales of ordinary size weighing about 100 pounds and in large bales of 200 pounds or more.

There are no current published data on manufacturing costs or prices paid for excelsior at plants. During the war period the last OPA plant ceiling prices on excelsior in the Lake States region ranged from \$25.75 per ton for the coarser grades to \$48.25 per ton for the finest aspen and basswood grades.

For some years before 1939 the production of excelsior was gradually decreasing; in that year the production of 53 plants in the United States was about 122,000 tons. Recent census figures for the Lake States region show that the consumption of excelsior wood in that region in 1946 was 95,000 cords or an increase of about 50 percent over 1936. It is not known what relation this Lake States figure bears to the corresponding national total.

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4 p. (F.P.L. rpt. no. 1711)

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