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Robert M. Kerr Food & Agricultural Products Center

FOOD TECHNOLOGY FACT SHEET

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Oriented Strand Board as a Building Material

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Introduction

Since the mid-1980s, oriented strand board (OSB) has been one of the most commonly used engineered wood-based panels for structural construction in residential sectors in North America. OSB was first produced in Canada in 1964, but it did not find its solid status in the market until the mid-1980s.

The number of OSB mills increased by more than 50 percent from 1990 to 1997. Today, total OSB production in North America is approximately 706 million ft^3 (20 million m^3), and there are about 20 companies that manufacture OSB in the United States, Canada and Europe.

Forest products companies are utilizing raw materials more efficiently with better technologies in more environmentally friendly ways. With this approach to managing forests, engineered wood composite products such as OSB have gained a significant role in the world market. A decline in plywood manufacturing in many countries, due to limited large log supplies and environmental concerns, will increase production of OSB in the future. OSB production is expected to continue to increase in North America and Europe and have the main share in the structural wood composite market.

This fact sheet summarizes basic manufacturing steps of OSB and some of its properties as a building material.

Basic Manufacturing Process of OSB

OSB is manufactured from fast-growing, small trees. West Coast inland mills producing OSB primarily use lodgepole pine logs averaging 10 to 12 inches in diameter at the breast height (DBH). Mills in the South use pine plantation thinning, Southern Pine and soft hardwoods species such as aspen with an average DBH of 8 inches.

Short segments of the logs are washed and debarked prior to strand production by using disk or ring type flakers. Generally, strand size is approximately 0.5 inch by 3 inches by 0.02 inch depending on the type of process and raw material. Size of the strands can be modified based on target specifications of the panel.

Figure 1. A schematic illustrating strand orientation of a typical OSB.

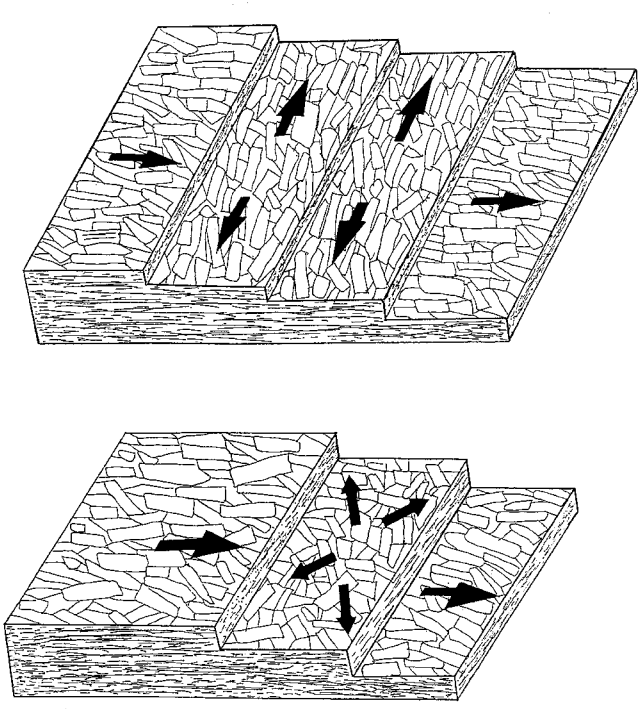
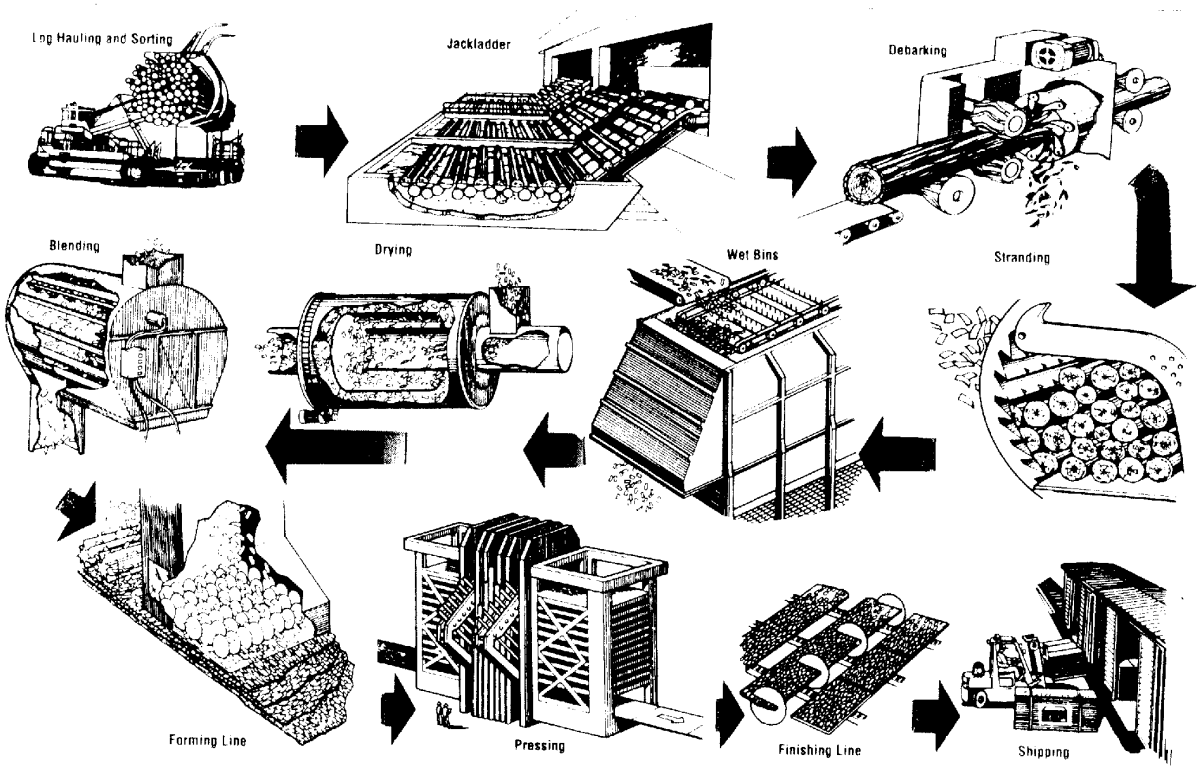


Figure 2. A general flow chart of OSB production.
From J. Lowood. Oriented Strand Board and Waferboard. 1997. Engineered Wood Products. PFS Research Foundation.



Since the moisture content of the strands ranges from 40 to 75 percent, they are dried to 5 to 10 percent moisture in large, rotating single-pass or triple-pass dryers with an inlet temperature of as high as 1,250°F.

Dried strands are classified into two sections using various sizes of screen. Larger strands are used for the face layers while the smaller strands are laid out in the core layer. Face and core layer strands are mixed separately with an exterior binder in a drum-type rotating blender. Depending on the process, a certain percentage of wax and other chemicals also can be applied during the blending process.

Figures 1 and 2 illustrate strand orientation of typical OSB and a general manufacturing flow chart of OSB, respectively.

In OSB manufacturing, phenol formaldehyde (PF) and diphenylmethane diisocyanate (MDI) are two types of water-resistant resin commonly used as binder. Strands coated with one of these resins are ready for mat formation, which is the most important process determining properties of the panel.

A simple design of spinning disks is used in the forming of the strands. Face and core layers of the mat are oriented opposite each other and sequentially dropped on the conveyor belt. The mat thickness depends on the final thickness of the pressed panel and its density.

In a general OSB plant, forming lines are about 6- to 8-feet wide. The mat is carried toward the press and a cross saw trims the mat to the desired panel length. Individual mats are loaded into a multi-opening press having 10 to 20 openings depending on the plant's capacity.

A combination of pressure and temperature is applied to cure the resin and give stiffness to the panel. Typical press parameters include a temperature of 400 to 425°F and a pressure of 650 to 800 psi for approximately 4 to 6 minutes. Pressed panels are removed from the press line and conditioned on a rotating cooler prior to cutting them into desired dimensions.

The panels are later sanded to improve their surface roughness. Certain processes, such as profiling with tongue and groove edges or the raised screen pattern on one face to eliminate slipping in roof application, can also be applied to the surface of the panels for special applications.

Applications

OSB is extensively used for wall sheathing, floor underlayment, roof cover and I-joist in both com-

Figure 3. Applications of OSB as siding and I-joist

mercial and residential building. OSB also is used in furniture, reels, trailer liners and recreational vehicle floors. Figure 3 shows siding and I-joist application of OSB in building construction.

Similar to other wood products, OSB also is prone to decay when conditions are optimum for biological microorganisms, such as fungus. Zinc borate and oxine copper are sprayed as fungicides to enhance resistance of OSB to biological deterioration. In general, OSB is not used for applications where there is direct contact with a moisture source, such as soil. However, brief periods of exposure to rain during the installation of OSB in residential construction should not cause any significant problems in terms of its dimensional stability.

It is recommended to leave a 1/8-inch gap between panels during installation to prevent possible buckling due to expansion. Most OSB panels also are treated with a sealant on the panel edges to reduce moisture penetration during the service life.

Some of the advantages of OSB over other wood based products are as follows:

- OSB can be used for both structural and non-structural applications, such as furniture frames, decorative wall paneling, shelving, packaging and crating, pallet manufacture, dry storage pallets and industrial tabletops.
- Opposite direction of the face and core layer strands give very high bending properties to OSB, which are almost comparable to ply-

Table 1. Some of the physical and mechanical properites of a typical OSB

PROPERTY	PLYWOOD	OSB
Bending strength		
Modulus of elasticity	1,0-1,9_10^6 psi	0.7-1,2_10^6 psi
Modulus of rupture	3,000-7,000 psi	3,000-4,000 psi
Tensile strength	1,500-4,000 psi	1,000-1,500 psi
Compression strength	3,000-5,000 psi	1,500-2,500 psi
Shear strength	600-1,000 psi	1,000-1,500 psi
Linear expansion (From 30% to 90% Relative humidity)	0.15 %	0.15 %

wood. If the surface of OSB is extensively sanded, it can even be used as substrate for overlays for special structural applications.

- Since OSB is manufactured from small diameter trees, it has a very low negative impact on environment as compared to plywood. One short coming of OSB is its lack of printability compared to plywood and its higher thickness swelling than plywood under the extreme conditions.

For More Information

APA The Engineering Wood Association
7011 S. 19th
Tacoma, WA 98466
(235)565-6600
www.apawood.org

Structural Board Association
25 Valleywood Dr. Unit 27
Markham, Ontario, Canada
(905)474-1100
www.osbguide.com

The Canadian Wood Council
99 Bank St. Suite 400
Ottawa, Ontario
Canada
1-800-463-5091
www.cwc.ca

PFS Research Foundation
2402 Daniels St Madison, WI 53718
(608) 221-3361
www.pfscorporation.com

Table 1 displays some of the physical and mechanical properties of sheathing grade OSB as compared to plywood.

The Oklahoma Cooperative Extension Service
Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; home economics; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and based on factual information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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